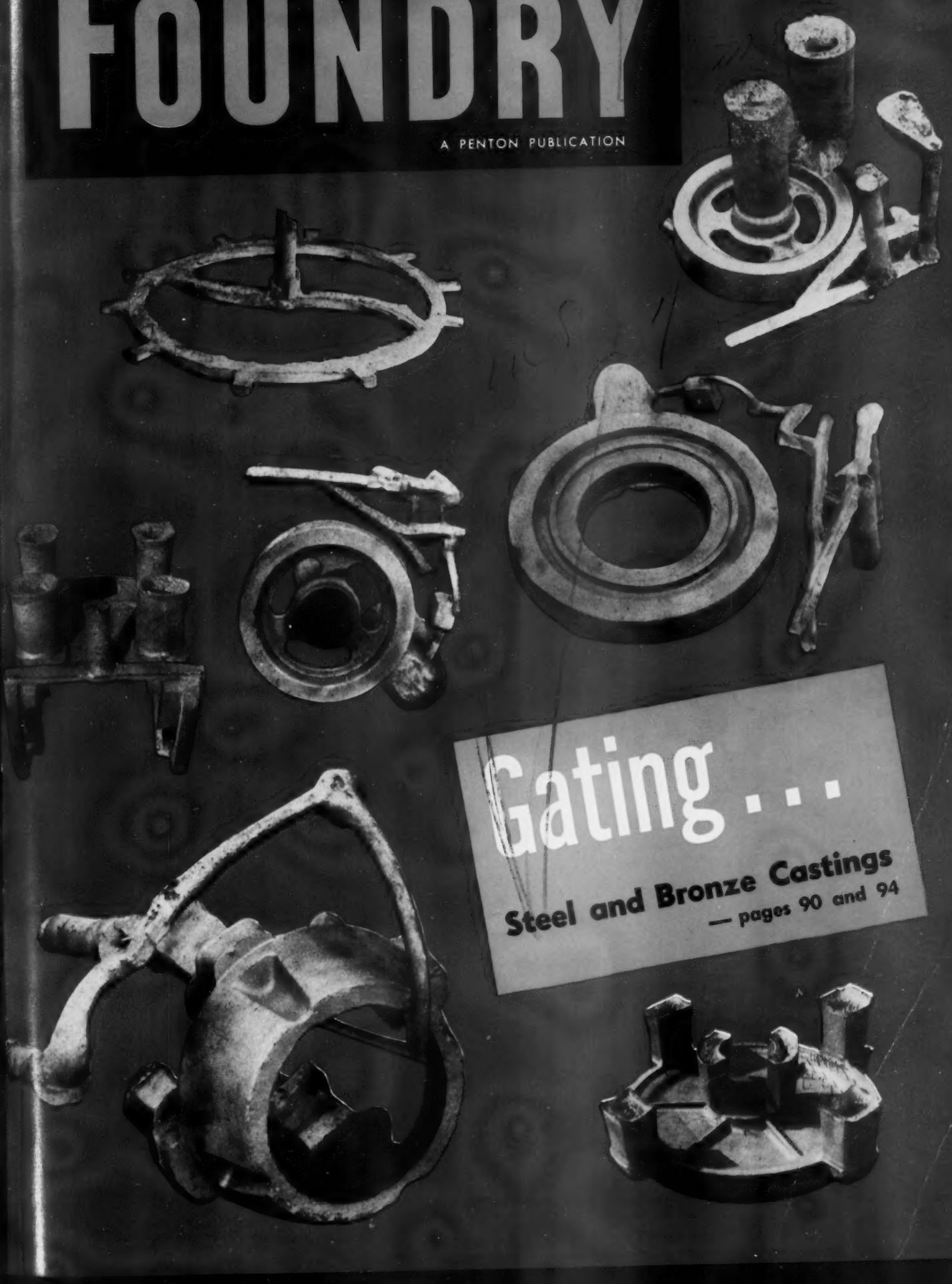
APRIL 1956

FOUNDRY

A PENTON PUBLICATION



Gating . . .

Steel and Bronze Castings

— pages 90 and 94

how to assure sound finished castings

Here are results proved by lead foundries from using Purite fused soda ash.

Sulphur control: Purite reduces sulphur content to a specified allowable per cent. When price or shortage forces the use of high sulphur scrap, you can still turn out quality castings.

Less bridging: Purite flux in the cupola increases fluidity of the charge, insuring better mix of materials, hotter melting and uniformity of process and product.

Economy: Purite is 100% fused soda ash; contains no inert waste. The solid two-pound pigs all go into the mix; none of it blows away as lost dust.

Convenience: Purite pigs are non-crumbling two-pound blocks. Handle easily. You measure out what you want simply by counting. Store indefinitely without loss.

Supply: Leading foundry supply houses distribute Purite in every area. For the name of your nearest supplier or for more information, please write—

MATHIESON

MATHIESON CHEMICALS
OLIN MATHIESON CHEMICAL CORPORATION
INDUSTRIAL CHEMICALS DIVISION • BALTIMORE 3, MD.

Who put the "Imp" in impellers?

...or how Chuck Wright turns the heat on chill

Pat Kelly, over at Avis Foundry, was casting pump impellers that came back from the machine shop almost as fast as he sent them over. The trouble? Chilled edges.

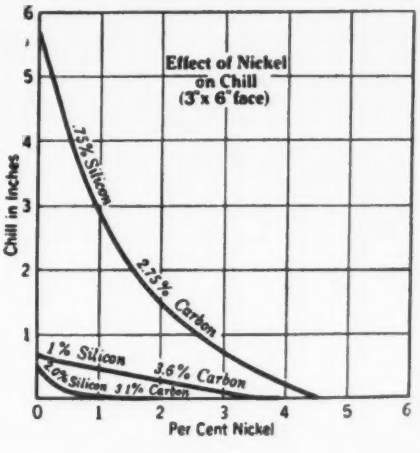
The machine shop, and the front office, too, beefed plenty. Chilled iron always means slow machining speeds, excessive tool wear and poor finish.

Pat noticed chilled edges on the first pieces poured. He increased the silicon in his mix to reduce chill. But this gave him open grained weak iron in the heavy hubs.

His foundry practice was tops. Molding, cores, temperature and so on couldn't be criticized. The trouble, however, was in another place. Pat's order called for castings that had sections varying, in the same casting, from 3/16" to 1½". And that was the rub.

High silicon reduces chilling tendency in thin sections, but results in opened grained, porous thick sections.

From my notebook, I gave Pat this graph illustrating the effects of nickel on chill.



You'll find, just as Pat did, that a little nickel is your best friend whenever you need dense, pressure-tight heavy sections along with strong, yet machinable lighter sections.

The boys at Avis now pour pump impellers in an iron of some 3.25% carbon, 2.30% silicon, and .75-1.00% nickel. Light sections permit high speed machining operations, because chill in the nickel iron is absent. What's more, there's a big saving from the new low finishing costs.

You can get rid of chills . . . and headaches, too . . . with a little nickel. But whether you use nickel or not, whenever you meet up with a difficulty involving the metallurgy of castings, get in touch with me. The easiest way to reach me is through INCO.

Chuck Wright

INCO
TRADE MARK

The International Nickel Company, Inc.

67 Wall Street New York 5, N. Y.

from...

FEDERAL's mines and refineries in the finest bentonite producing areas in Wyoming and South Dakota comes...

FEDERAL GREEN BOND BENTONITE

"the best of the bentonites"

- ★ LOW TO MEDIUM VISCOSITY
- ★ LOW GELATINATION
- ★ HIGH GREEN BOND STRENGTH
- ★ HIGH DRY BOND STRENGTH
- ★ AVAILABLE IN PULVERIZED, GRANULAR OR SLURRY GRADES

If it's better, more uniform sand control you're after— write for a copy of "Tailor-Made Molding Sands".

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"FGB" also stocked in BIRMINGHAM, CHATTANOOGA, JACKSONVILLE, Fla., OAKLAND, Calif., PORTLAND Ore., SEATTLE, Wash., ST. LOUIS

For more information, use Reader Service Card, page 187

FOUNDRY

A PENTON PUBLICATION

April 1956

Volume 84—Number 4

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(For addresses of branch offices, see page 283)

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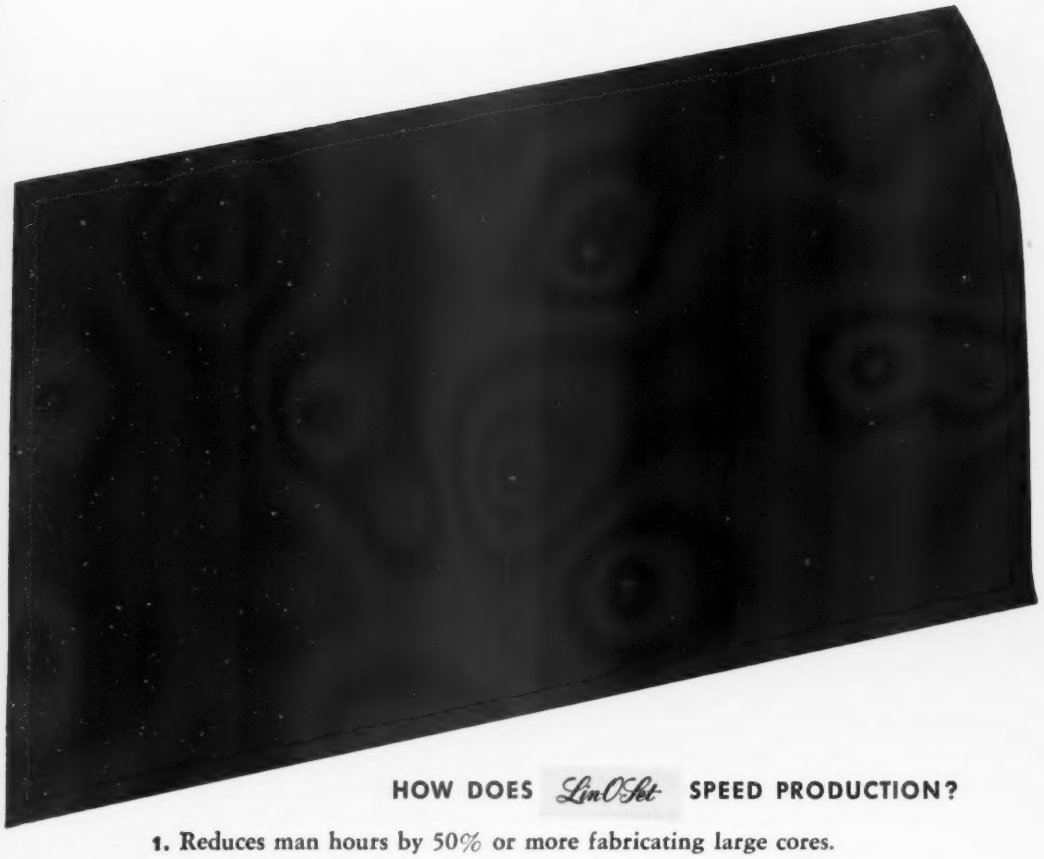
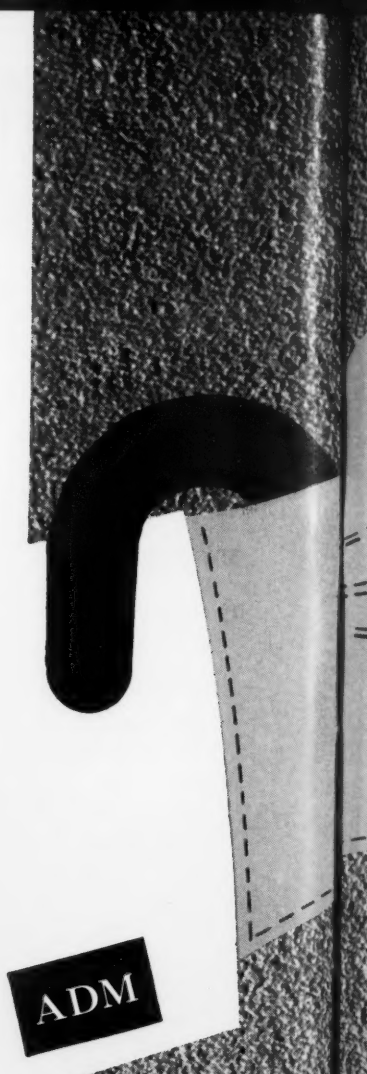
ADM presents with pride the V.I.P.* of core binders...





HOW DOES *LinOSet* SPEED PRODUCTION?

1. Reduces man hours by 50% or more fabricating large cores.
2. Fewer rods are needed for reinforcement because LIN-O-SET cores are stronger before and after baking.
3. Average baking time is reduced by 30%.
4. Collapsible LIN-O-SET cores shake out like sugar . . . drastically reduce cleaning time.

HOW DOES *LinOSet* IMPROVE CASTING QUALITY?

1. LIN-O-SET cores resist deformation during baking; maintain excellent dimensional stability; set up on contact with core box.
2. Sand systems are uncontaminated by LIN-O-SET.
3. LIN-O-SET cores improve casting finish.

ANY OTHER *LinOSet* ADVANTAGES?

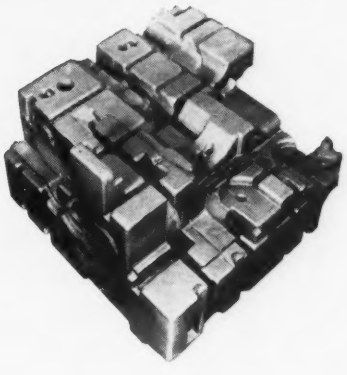
1. LIN-O-SET lets you accurately control set-up time regardless of operational or climatic conditions.
2. LIN-O-SET is immediately adaptable to practically all sand mixing procedures. No special measuring or mixing equipment needed.
3. LIN-O-SET cores do not produce toxic fumes or objectionable odors.
4. Normal wash procedures may be employed without damage to cores.
5. LIN-O-SET and LIN-O-SET bonded cores offer indefinite storage life.

Lin-O-Set

✱ V.I.P. means very important product—very important to foundrymen looking for ways to cut costs. More than just another binder, LIN-O-SET is a *New Method* of core making designed especially for medium-to-heavy work and especially suited to jobbing foundries. A specialized quick curing core binder that "sets up" at room temperature, the purpose of LIN-O-SET is to speed production and improve casting quality.

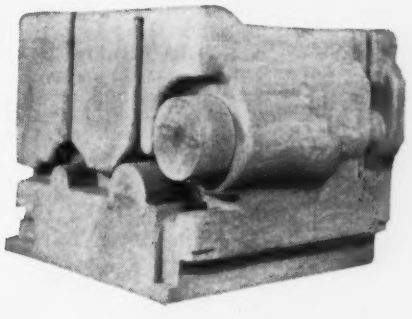
SOME FOUNDRIES SAY: "It's expensive *Not* to use new LIN-O-SET." For instance, these examples of heavy, intricate cores are produced in a comparatively short time and with no complications . . .

AT ST. MARYS FOUNDRY CO., *St. Marys, Ohio:*



Intricate St. Marys core made with LIN-O-SET was used to produce a horizontal boring mill head weighing 2946 lbs. and measuring 31½" x 36" x 44". Ramming and finishing this core was regularly a 5¾ hour job. With LIN-O-SET it now takes only 1¼ hours . . . over 3 times as fast.

AT STATE FOUNDRY CO., *Akron, Ohio:*



New LIN-O-SET core mix enabled State Foundry to fabricate this 1740 lb. core in 1¾ hours, a job which previously took 8 hours using conventional binder. This core, measuring 31" x 39" x 27", is used in producing a 62" vertical boring mill base.

These cores may be seen at the 1956 AFS Castings Congress, Atlantic City—Booth 1636-38

Archer · Daniels · Midland company

FOUNDRY PRODUCTS DIVISION • 2191 WEST 110th ST., CLEVELAND 2, OHIO

LINOIL **INDUCTOL** **LIN-O-CEL** **FRE-FLO** **ADMIREZ** *Lin-O-Set*

DELTA
FAST-DRI
LIQUID RESIN BINDERS

FOR

FASTER PRODUCTION OF BETTER CORES

at lower cost!

Cores made with DELTA 155-X and 168-X FAST-DRI Liquid Resins have 1) — an unusually high tensile strength (20% greater than linseed oil), 2) — a lower gas ratio, 3) — a higher degree of elasticity, 4) — less core embrittlement and 5) — greater surface core hardness.

Core sand mixes made with DELTA FAST-DRI Liquid Resin binders have excellent flowability resulting in denser cores and better workability in core boxes.

The uniformity of DELTA 155-X and 168-X FAST-DRI Liquid Resin binders is guaranteed. The chemical and physical constants are maintained by strict laboratory control.

Get the facts...

Working samples for test purposes together with complete data are available to you. Included, also, will be information on other Delta Core Oils, Delta Dri-Bond and Delta Bondite. Your request will receive immediate attention.

DELTA

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

B.F.Goodrich

3000-degrees hot but doors don't melt

A typical example of B. F. Goodrich improvement in rubber

THERE'S melted steel inside those big furnaces. Temperature is 3000 degrees. The heavy steel doors would melt in minutes except for that hose that carries a stream of cooling water in and out of them.

But hose was burning out in months or even weeks. It had to stand heat 24 hours a day, seven days a week, was often banged by big "charging machines," spattered with hot metal. Then B. F. Goodrich developed a new kind of hose made of wire, asbestos and rubber. It had been in use more than a year when the above picture was taken. It is less expensive than the hose used before, is much lighter and more flexible, easier for workmen to handle. One man can install it where two men were needed for other hose.

B. F. Goodrich has made hundreds of improvements in dozens of kinds of hose to make them last longer, cost less, save your time and money. Most improvements, while making the hose stand more abuse, have also made it more flexible and easier to handle. B. F. Goodrich makes hose to carry almost anything—air hose that stands sharp flying rocks outside and hot oil inside, burstproof steam hose that can't burst even if it wears out, hose that lasts for years carrying gasoline, paints, chemicals, even dry materials such as flour or cement.

Call your B. F. Goodrich distributor for more information about any kind of hose, belting or other rubber products. *The B. F. Goodrich Company, Department M-582, Akron 18, Ohio.*

B.F.Goodrich

INDUSTRIAL PRODUCTS DIVISION

the BIG SHOWING at the BIG SHOW!

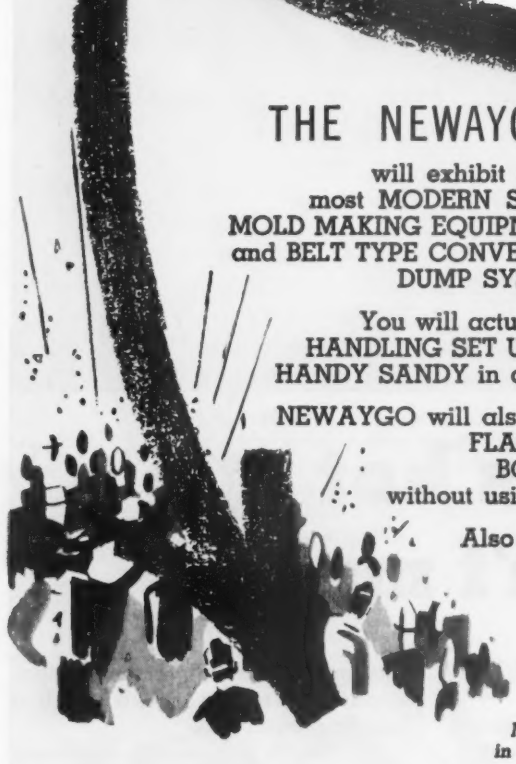
THE NEWAYGO ENGINEERING COMPANY

will exhibit at the AFS Show an operating display of the most MODERN SAND HANDLING, CASTING HANDLING and MOLD MAKING EQUIPMENT. The display will include OSCILLATING and BELT TYPE CONVEYORS as well as a PALLET and AUTOMATIC DUMP SYSTEM for MOLD HANDLING and SHAKEOUT.

You will actually see molds made by this WORKING SAND HANDLING SET UP which will also feature the LATEST DESIGN HANDY SANDY in conjunction with OVERHEAD SAND HOPPERS.

NEWAYGO will also introduce the NEW MONARCH KWIK-STRIP FLASK and a NEW TYPE OF UPSET and BOTTOM BOARD, allowing molds to be made and set out without using conventional bottom boards for each mold.

Also featured will be a new design of a 36" diameter ROTARY TABLE FEEDER for use with shell making and blowing machines.



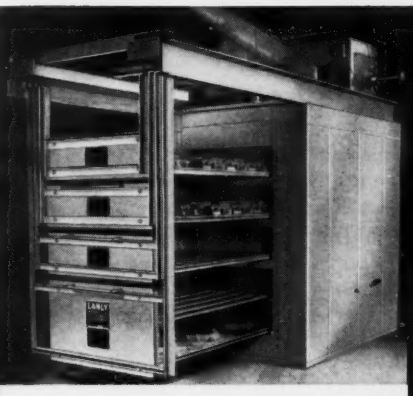
Newaygo Representatives will be in attendance throughout the show.

BOOTHS
1740–42 1841–43
Aisles 1700–1800

"Foundry Business is BIG Business"

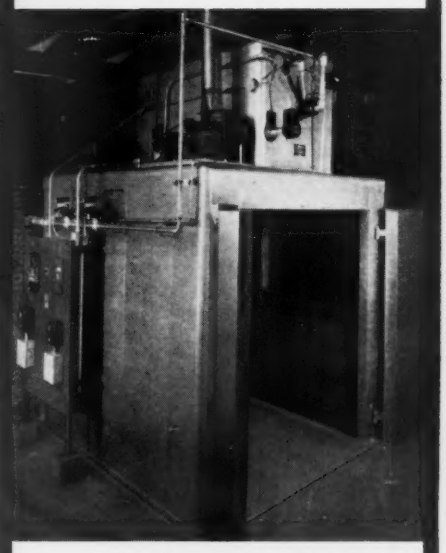
NEWAYGO engineering company
NEWAYGO, MICHIGAN

. . . and profitable too, with NEWAY® MOLD HANDLING, SAND HANDLING AND CONDITIONING EQUIPMENT



Drawer, . . .

. . . Rack, or



Car Type OVENS . . .

In your Foundry a

LANLY

Installation . . .

Will aid in . . .

Reducing Fuel Costs, Reducing Handling Costs, Improving Production Quality, Increasing Production

FASTER, BETTER and LESS COSTLY PRODUCTION . . . Time worn words to be sure, but what Foundry today would not welcome this in view of increasing competition, labor costs and more demands upon its facilities.

There is no better time than NOW to examine your production operations.

Check your ovens! Are they fuel eaters, heat losers or core spoilers? Ask the men who operate them!

Chances are you'll find unexpected revelations that will merit a phone call or letter to us.

We'll be pleased to discuss your problems without obligation.

WRITE FOR THE LATEST CATALOG AND FACTS ON ANY INSTALLATION

LANLY
FOUNDRY OVENS
THE LANLY COMPANY • 780 PROSPECT AVE
CLEVELAND, OHIO

All the "hot stuff" in this foundry rides Imperial Belts

Imperial INNERLOCKED* Belts have won top position handling hot foundry sand in The McNally Pittsburgh Foundries, Inc., plant, built in 1945.

On the conveyor shown above, an Imperial Super-Insulated Sahara Belt (80′ x 24″ x 6-ply) carries searing, sizzling shakeout sand so hot it requires the heat-resisting capacity of Imperial's 600° belt.

Best for foundry service. Many foundries throughout this country and Canada use only Imperial belting on their "hot" conveyors and elevators. Experience has shown this heavy-duty canvas belting with its exclusive INNERLOCKED* stitching and superior heat-resistant impregnating compounds lasts much longer than lesser belts.

Asbestos layers withstand temperatures to 600°F. For protection from severe impact and abrasion, metallic reinforcement is available at no extra cost.

Job-designed belting. Whatever your needs, there is an Imperial Belt job-designed to give you lowest ultimate belt cost and highest day-to-day operating satisfaction. Write for Data Sheet 54-2 which describes Imperial Belts for foundry service.

**INNERLOCKED—Reg. trade name of Imperial Belting Co.*

Imperial
BELTING CO.
1755 S. Kilbourn Ave., Chicago 23, Ill.

You expect MORE from Imperial . . . and you get MORE!

With the EDITORS

THE MAY ISSUE: As announced last month, FOUNDRY in May will present a special editorial report on "The Tools for Tomorrow's Foundry Progress." This five-section report is being prepared by the editors.

The first section will review recent technical progress in the production of castings, and will discuss where we stand as we look to the future development of the industry. The second section will consider developments in mechanization, modernization and automation as applied to the foundry industry.

The third section will indicate future trends in the design of equipment and the development of materials used in foundries. A number of manufacturers of equipment and supplies have co-operated in the preparation of this section by looking into the crystal ball for us.

The fourth section discusses what foundrymen would like to have in the way of equipment and supplies, and was prepared from comments received from a number of men engaged in the production of castings.

The last section discusses the part management must play in the future growth of the foundry industry and tells of the progress that already has been made.

This special report, information on the AFS Congress and Exhibit at Atlantic City, a number of feature articles and the regular departments should make the May issue of exceptional interest to all readers. It will be in your hands before the convention opens.

—o—

Spring Flowers: When Ken Mountain was in Jeannette, Pa., collecting the information for the article on the Elliott Co. foundry which appears in this issue, he learned that eight years ago Pete Evangeliste, foundry superintendent, laid out a flower garden outside his office. Since then this project has become an "institution" with the foundry employees as well as over a thousand others working in the company's huge main works. Pete says the foundrymen especially take a keen interest in the flowers and he is positive it has a psychological effect upon them as they walk by each day entering and leaving the foundry.

—o—

A Fine Gift: The Past Chairman's Club of the Central New York AFS chapter has just completed a project of unusual interest. The past chairmen contributed to a fund which was used to purchase 69 volumes on foundry practice published by the society. These volumes were presented to the Engineering Department Library of Syracuse University as a memorial to the late Frank Wheeler, Kimman & Wheelr Co., a former chairman of the chapter. Presentataion was made at a chapter meting and Dr. H. P. Munger of Syracuse University accepted the gift.

Everything that helps the engineering student to gain more information on castings helps the industry.

—o—

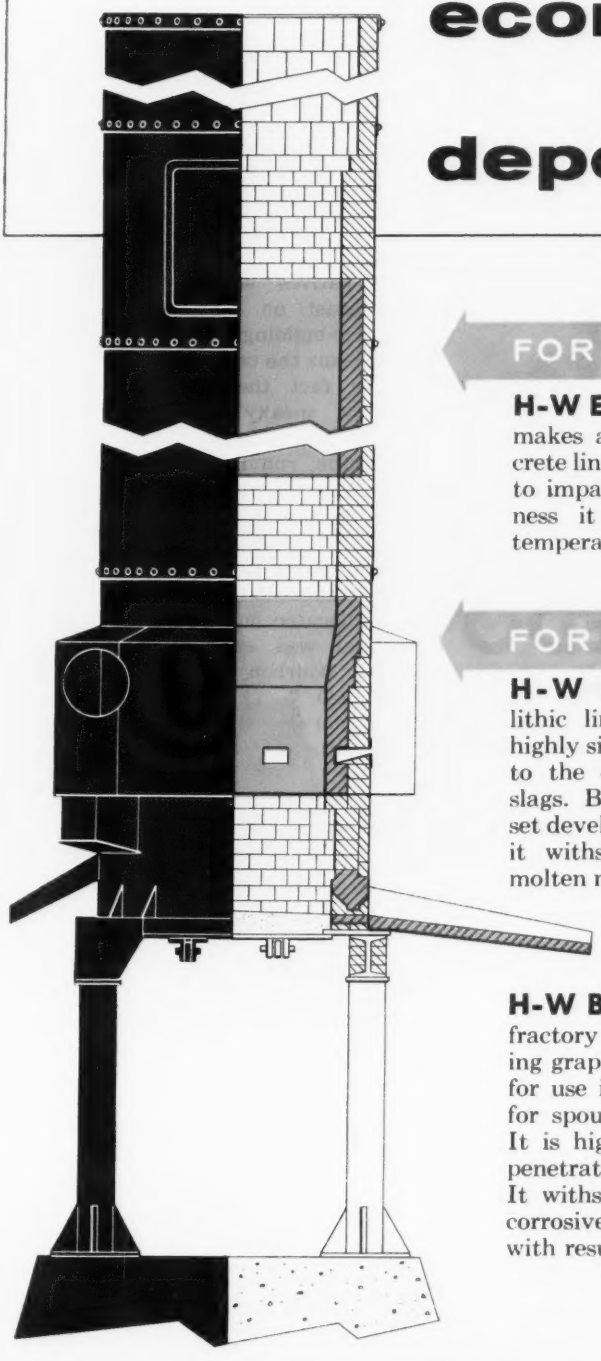
Nickel Research: The growth of research at International Nickel Co. is well illustrated in a folder on employee activities recently sent along by James S. Vanick, one of our frequent and valuable editorial contributors. The center spread of this leaflet shows two photographs of the laboratory personnel—one taken in 1955, when 120 men and women were employed in research at Bayonne, N. J., the other taken 30 years earlier. The 1925 photo included O. B. J. Fraser, N. B. Pilling, E. J. Bothwell and Jim Vanick, all well known in the foundry industry.

The early photo takes me back to the first contact with the boys at the laboratory when in 1928, Ed Both-

Harbison-Walker *Monolithic* cupola linings

economical to install and maintain . . .

dependable in service . . .



FOR THE CHARGING ZONE

H-W Extra Strength Castable makes a hard, strong refractory concrete lining which is extremely resistant to impact and abrasion. In refractoriness it is adequate for service at temperatures up to 2400°F.

FOR THE MELTING ZONE

H-W Kuplomix provides monolithic linings free from joints. It is highly siliceous and extremely resistant to the corrosive action of non-basic slags. Because of the strong ceramic set developed at working temperatures, it withstands the erosive action of molten metal and slag to a high degree.

FOR THE BOTTOM ZONE

H-W Black Patch is a plastic refractory of super-duty quality containing graphite, which is especially suited for use in the cupola breast wall and for spouts, runners and ladle linings. It is highly resistant to wetting and penetration by molten iron and slags. It withstands the severe erosive and corrosive action of metals and slags with resultant longer service life.

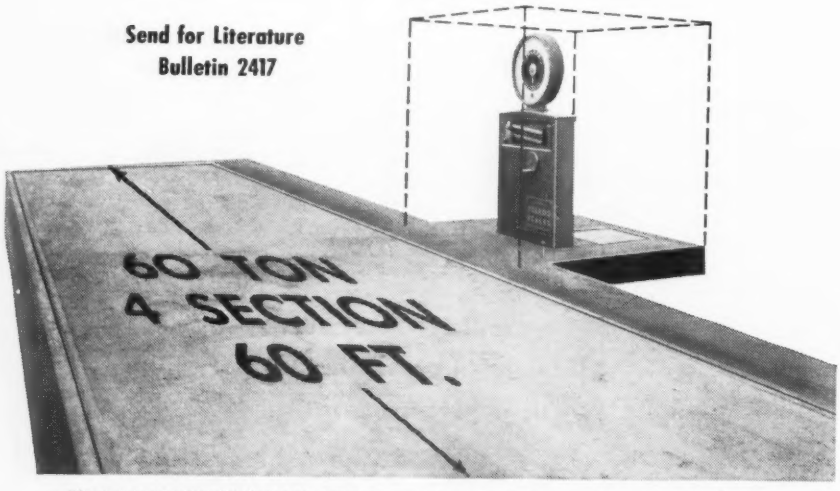
In addition to the above, Harbison-Walker products include all classes of commercial refractories for every foundry requirement.

HARBISON-WALKER REFRACTORIES CO.
AND SUBSIDIARIES
World's Largest Producer of Refractories
GENERAL OFFICES: PITTSBURGH 22, PENNA.

It Pays To Check On New TOLEDO *Hi-Weigh* TRUCK SCALES

Guard against doubtful truck weights that are so costly in money and good will . . . in your dealings with customers, with vendors, with highway enforcement officials. Check the load on *new* TOLEDO Hi-Weigh Truck Scales! Engineered for today's heavy duty needs . . . choice of two-section, four-section or axle load in full range of models. New design means lower installation costs . . . plus long-life Toledo accuracy and durability. All Toledo Hi-Weigh Scales available with Toledo Printweigh for recording weights on tickets, strips, or sheets. Toledo Scale Company, Toledo 1, Ohio.

Send for Literature
Bulletin 2417



NEW ECONOMY IN INSTALLATION . . . These BIG four-section scales are built to weigh the heaviest and largest highway vehicles to meet needs today . . . and tomorrow. Toledo engineering has integrated lever, weighbridge, and pit design to achieve high strength combined with economical, long-life installation.

SERVICE Factory-Trained 200 Cities

TOLEDO®
HEADQUARTERS FOR SCALES

well and I collaborated on an article, "Philadelphia Foundry Alloys Gray Iron with Nickel." The article was presented in the May 1, Pre-convention issue that year and represented one of the early discussions of nickel as an alloy for gray iron.

—o—

The Town Pump: Some little time ago the *Chicago Tribune* ran a story about the town of my birth that bears out some of the things I have been telling the boys down at the office:

"Bourbon, Ind.—A man might think, in the town of Bourbon, that the natives would rise early and breakfast on vast dollops of this muscle-building fluid. But this is by no means the case.

"In fact there is evidence of a pretty sneaky worship of water. Right there on the main corner is a statue, run up in 1929, to the old wooden town pump which stood there.

"This memorial, bearing a likeness of the old wooden pump, has an inscription that reads as follows: 'In Remembrance of the Old Town Pump once located on this corner. This memorial was erected by the South Bend Bourbon Club. Dedicated June 30, 1929.' "

If you ever travel Indiana on Route 30, take a look at "Bourbon and Water."

—o—

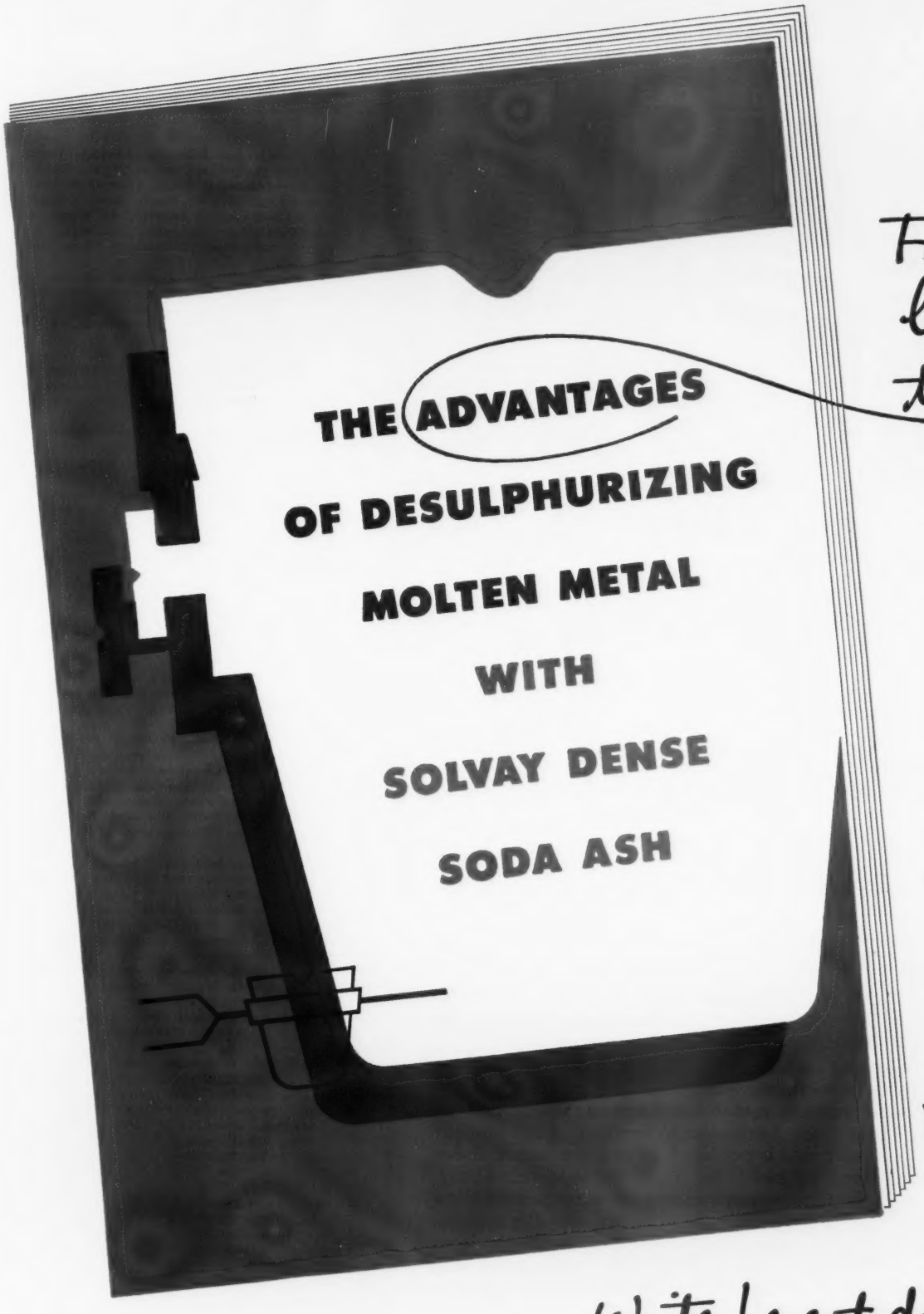
Adverse Publicity: Foundries in the United States have had their share of unfavorable publicity in the general press and through other mediums of mass communication. But other countries also have theirs, as is evidenced by the following from an editorial in the Feb. 2, 1956 issue of *Foundry Trade Journal:*

> We did not see the recent television programme covering the casting of bells, but it appears that prominence was given to the incorporation of horse-manure in the sand mixture.
>
> This gave, especially to the womenfolk who formed much of the gigantic audience, a feeling of nausea or "the creeps," as one lady put it to us. It is axiomatic that the mother's influence is very great when the choice of a career for her son is under consideration.
>
> All the propaganda based on the fact that horse-manure is very seldom used—and never by the largest concerns—or that as a raw material it is unnecessary and can without detriment be superseded by more salubrious material has been largely birth-strangled by this broadcast.
>
> We ask readers, when dealing with the agents of lay publicity, to remember that such people seldom have the interests of our industry at heart, but are merely searching for incidents capable of arresting the attention of the reader, listener or viewer. Thus it is as well, when encountering such situations, to bear in mind the long-term effects on the whole industry, for it is better to have no, rather than adverse, publicity.

—o—

Just a Thought: Wouldn't it be great if the Department of Commerce would be as zealous in promoting the interest of business as the Department of Labor appears to be in pushing the interests of organized labor?

F.G.S.



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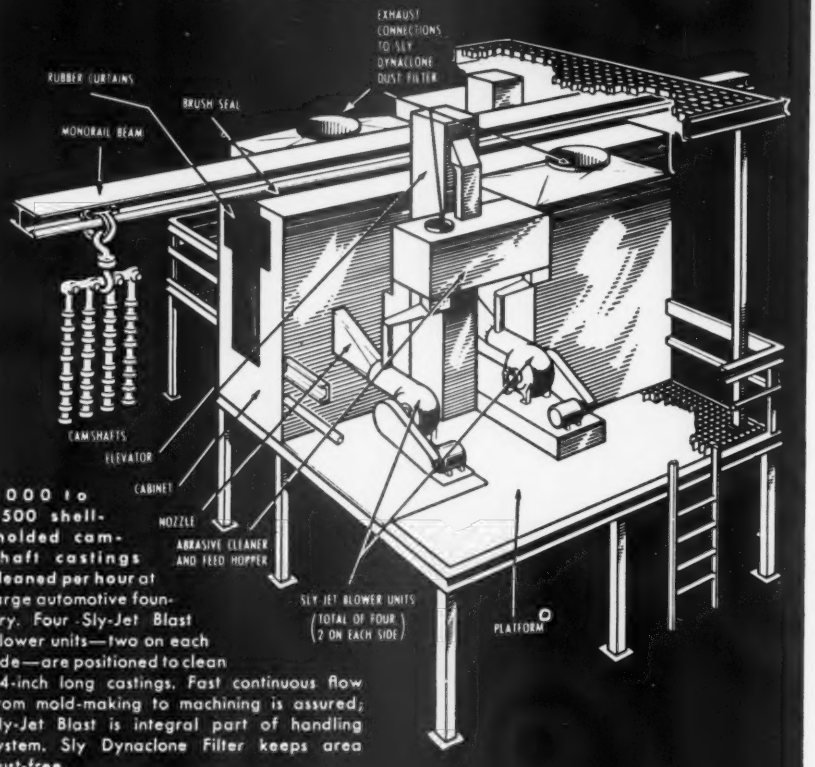
NEW LOW-COST WAY TO CLEAN SHELL-MOLDED CASTINGS



1000 to 1500 shell-molded camshaft castings cleaned per hour at large automotive foundry. Four Sly-Jet Blast blower units—two on each side—are positioned to clean 24-inch long castings. Fast continuous flow from mold-making to machining is assured; Sly-Jet Blast is integral part of handling system. Sly Dynaclone Filter keeps area dust-free.

NEW SLY-JET BLAST

Eliminates need for air compressor . . .
Eliminates maintenance costs of airless wheels

Now, clean shell-molded castings faster, at lower cost. With new, *low-velocity* Sly-Jet Blast, cleaning action is thorough yet "gentle"— therefore, no pitting, no removal of parent metal, no warping or distortion as with other cleaning methods. *Efficient*—abrasive is accurately directed over a large work area through a stationary nozzle, which can be set at any angle from horizontal to vertical. *Economical operation*—blower unit is powered by electric motor; there is no compressor, no need for high horsepower. *Long, trouble-free operation*—there are no moving parts in the blast zone; abrasive is introduced directly into the nozzle. *Versatile*—nozzle opening can be in any shape from circular to rectangular and any size. Abrasive can be any grade of sand, most grades of grit. *Non-stop operation*—cleaning mechanisms can run continuously for effective integration in continuous-flow handling systems.

Take the problem and expense out of cleaning shell-molded castings. Write today for the facts on new Sly-Jet Blast.

THE W. W. SLY MANUFACTURING CO.
SINCE 1874
4753 TRAIN AVENUE • CLEVELAND 1, OHIO

OFFICES IN PRINCIPAL CITIES

CALENDAR of Meetings

Apr. 3—Material Handling Institute, spring meeting, Edgewater Beach Hotel, Chicago.

Apr. 3-4—Industrial Truck Association, spring meeting, Edgewater Beach Hotel, Chicago.

Apr. 9-11—American Institute of Mining and Metallurgical Engineers, national open hearth conference, Netherland Plaza Hotel, Cincinnati.

Apr. 12-13—Malleable Founders' Society, annual market development conference, Edgewater Beach Hotel, Chicago.

Apr. 17-19—Magnesium Association, casting and fabricating divisions, Hotel Bancroft, Worcester, Mass.

Apr. 18-19—Armour Research Foundation, Illinois Institute of Technology, national industrial research conference, Hotel Sherman, Chicago.

May 3—Non-Ferrous Founders' Society, annual business meeting, dinner and reception, Marlborough-Blenheim Hotel, Atlantic City, N. J.

May 3-9—American Foundrymen's Society, annual convention and exhibition, Convention Hall, Atlantic City, N. J.

May 9-11—American Welding Society, spring meeting and 4th welding and allied industry exposition, Buffalo.

May 9-11—Investment Casting Institute, annual spring meeting, Hotel New Yorker, N. Y.

May 9-19—Mechanical Handling Exhibition & Convention, Earls Court, London.

May 10-11—Refractories Institute, annual meeting, Grand Hotel, Point Clear, Ala.

May 20-23—Industrial Heating Equipment Association, spring meeting, The Homestead, Hot Springs, Va.

May 24-25—Malleable Founders' Society, technical and operating conference, Wade Park Manor Hotel, Cleveland.

June 5-8—Material Handling Institute, exposition, Cleveland Public Auditorium, Cleveland.

June 11-12—Malleable Founders' Society, general meeting, The Homestead, Hot Springs, Va.

June 17-22 — American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 24-26—Alloy Casting Institute, annual meeting, The Homestead, Hot Springs, Va.

July 17-30—Materials Handling Training Conference, Lake Placid, N. Y.

Sept. 1-9—Association of German Foundrymen, International foundry exhibition and trade fair, Dusseldorf, Germany.

Sept. 11-13—American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago.

Sept. 17-21—Instrument Society of America, instrument-automation conference and exhibit, Coliseum Bldg., New York.

Sept. 24-25—Steel Founders' Society of America, annual fall meeting, The Greenbrier, White Sulphur Springs, W. Va.

Sept. 24-26—Material Handling Institute, fall meeting, The Greenbrier, White Sulphur Springs, W. Va.

Oct. 4-5—Magnesium Association, annual meeting, Drake Hotel, Chicago.

Oct. 8-12—American Society for Metals, national metals congress and exposition, Public Auditorium, Cleveland.

Oct. 11-12—National Foundry Association, annual meeting, Detroit.

Oct. 18-20—Foundry Equipment Manufacturer's Association, annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

Oct. 20-23—Conveyor Equipment Manufacturer's Association, annual meeting, The Greenbrier, White Sulphur Springs, W. Va.

Oct. 29-30—Refractories Institute, fall meeting, The Homestead, Hot Springs, Va.

Oct. 30-Nov. 2—Gray Iron Founders' Society, annual meeting, The Homestead, Hot Springs, Va.

Nov. 26-30—Third International Automation Exposition, New York Trade Show Bldg., New York.

Nov. 29-30—Michigan Regional Foundry Conference, Union Bldg., University of Michigan Ann Arbor, Mich.

Don't talk fancy claims to him!

When it comes to abrasives, a foundryman needs to know two things. How does it clean? What does it cost in operation? Different jobs may require different abrasives but the result should always be the same—a *good* job at *lowest cost.* Malleabrasive and Tru-Steel abrasives give you that. Whichever you need, Pangborn makes sure you get the right abrasive for every job. Talk to one of our sales engineers or order from Pangborn Corp., 1400 Pangborn Blvd., Hagerstown, Md.

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Maintenance costs slashed by this specially engineered belt

For speed and savings buy from your industrial supply distributor. He can help you select the right belt for your jobs—and, if necessary, bring you the free consultation service of Quaker-Quaker Pioneer field engineers.

Are your hot-materials handling jobs takıng an unnecessarily heavy toll in belt costs? They needn't—if you use conveyor belts specially engineered for your specific job conditions. Here's a case that gives real weight to that argument. For 11 months this belt hauled 850,000 tons without requiring replacement—more than double the life of belts previously used on this job. It is one of several types engineered by Quaker-Quaker Pioneer for jobs involving temperatures over 400°F. Some, like this one, are rough top construction enabling the belt to react rapidly to cooling methods. Others are of newly developed compounds, exceptionally heat-resistant to prevent hardening and cracking. Get the cost-saving benefit of this specialization by telling us—or your distributor—*your* problems. Our complete line contains everything you need in industrial rubber products, including hose, packing and moulded rubber for every use.

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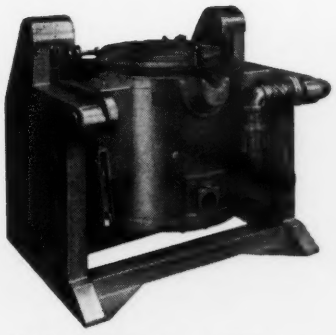
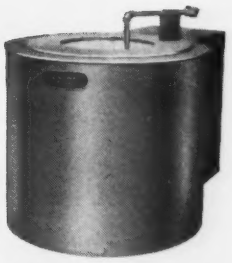


Lindberg-Fisher type MNP nose-pour tilting crucible furnace. Pouring lip is located in the axis of tilting providing a constant pouring arc regardless of degree of furnace tilt. Capacities up to #800 crucible with brass, up to #1000 crucible with aluminum. Oil or gas fired. Described in Bulletin 57-A.



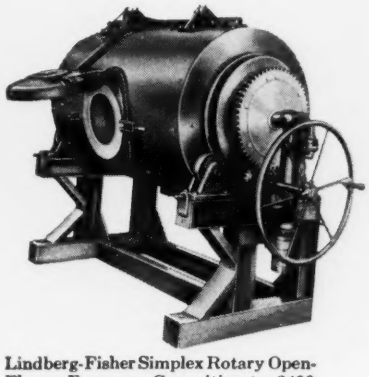
Lindberg-Fisher Electric Resistance Melting and Holding Furnace equipped with heavy duty resistance elements which give uniform distribution of heat, insuring long element and pot life. Capacities 250 to #1000 crucible.

For Non-Ferrous Metals

A complete line of

LINDBERG FISHER

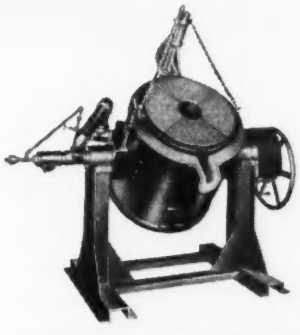
MELTING AND HOLDING FURNACES



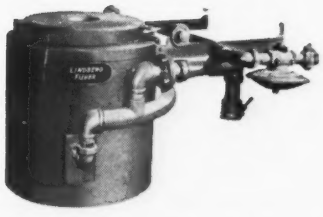
Lindberg-Fisher Simplex Rotary Open-Flame Furnace. Capacities to 2400 lbs. aluminum. 6000 lbs. brass. Oil or gas fired. Described in Bulletin 29-A.

For Melting Aluminum • brass • yellow brass bronze • copper • copper nickel alloys • lead magnesium • nickel • tin • zinc.

Because Lindberg-Fisher builds *all* kinds of melting equipment... gas... oil... electric... induction, and Carbon arc... L-F engineers are able to recommend, without prejudice, the proper type of furnace for *your* particular melting requirements.



Lindberg-Fisher type BB1 Hand-Tilt Crucible Furnace. Tilting mechanism consists of a hand wheel, driven through machined worm gear and pinion reducing gears. Capacities 50 to #400 crucible. Oil or gas fired. Described in Bulletin 400.



Lindberg-Fisher type SF stationary crucible furnace features rapid melting and is recommended for general foundry casting work. Capacities 30 to #400 crucible. Oil or gas fired. Described in Bulletin 301.

Melting specialists for 25 years

Sales and service offices in principal cities

LINDBERG FISHER MELTING FURNACES

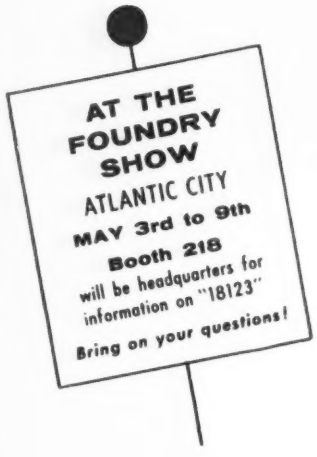
A Division of Lindberg Engineering Company, 2453 West Hubbard Street • Chicago 12 • Illinois

For more information, use Reader Service Card, page 187

ANNOUNCING

...a new phenolic resin that overcomes many major problems encountered in shell molding...

DUREZ 18123



This unique dry-mix resin —the outcome of broad-scale field and laboratory research—is stronger and faster curing, and provides the following advantages in producing shell molds...

- More economical resin-to-sand ratios—
- Molds are more uniform in structure and density—
- Uniform mold build-up in pattern sections with deep draws—
- No peel-back or fall-off on high projection patterns—
- Faster cure permits use of minimum cycles—
- Rigidity and absence of warp make gluing operation less critical—
- Greater cold and hot strength minimizes tendency to crack on pouring of metal—
- Greater uniformity of mold formation over a wider range of pattern temperatures.

Extensive use indicates the value of Durez 18123 resin in solving problems associated with bulk production of precision shell castings. But no experience can be so convincing as your own. Why not order a trial shipment now and prove its advantages on your next job?

DUREZ®

Phenolic Resins that fit the job

DUREZ PLASTICS DIVISION

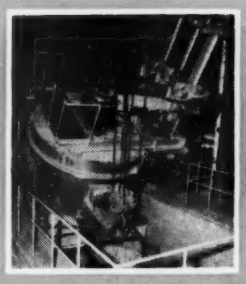
HOOKER ELECTROCHEMICAL COMPANY

1004 WALCK ROAD, NORTH TONAWANDA, N. Y.

HOOKER CHEMICALS & PLASTICS

Export Agent: Omni Products Corp., 460 Fourth Avenue, New York 16, New York

• ONE OF A SERIES OF MESSAGES TO MODERN FOUNDRY MANAGEMENT



SWINDELL

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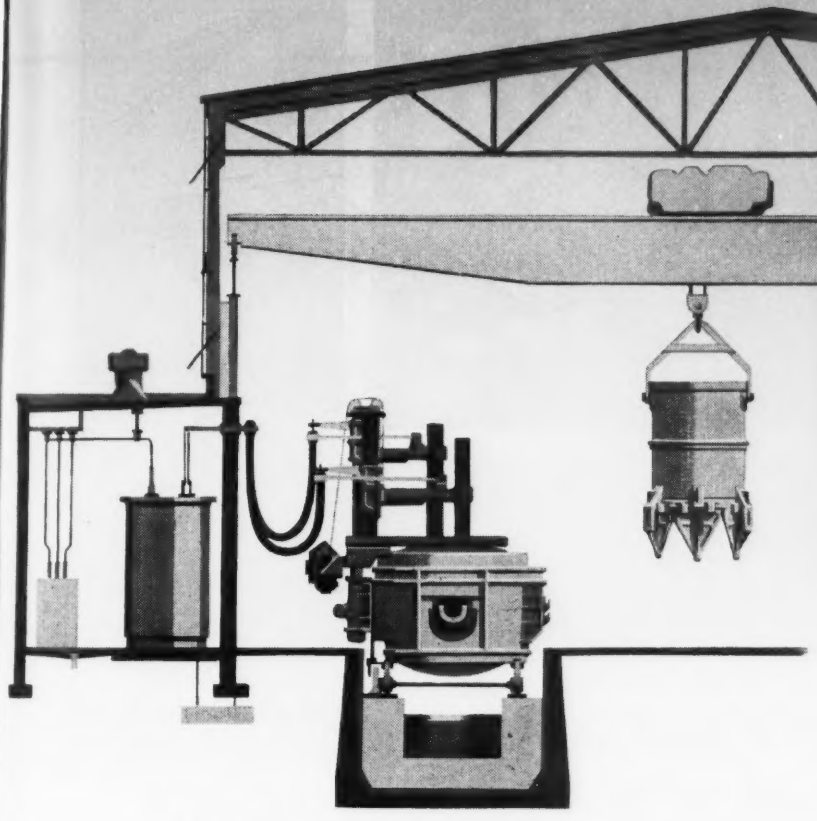
FOUNDRY ELECTRIC MELTING FURNACES



SIMPLE, LOW-COST FOUNDATIONS

—another SWINDELL quality feature

- ***You save*** because Swindell design calls for a minimum of excavation, materials and waterproofing, without sacrifices of strength and dependability.
- ***You save*** because Swindell simplicity sharply reduces construction time.

Because SWINDELL's electrode hoist mechanism is on the furnace, cable tunnels and oil piping trenches are eliminated. Because the roof cylinder is integral with the furnace, no special concrete foundation is required. And where trunnion-type furnaces are specified, our hydraulic cylinders are floor-mounted, avoiding potentially fire-hazardous cylinder pits. • Such simplicity and savings are carried through on the component furnace features. At every point, Swindell know-how serves you!

SWINDELL Electric Melting Furnaces for foundry service provide the productivity, low maintenance and long useful life built-in by genuine steel mill design and construction by steel mill melting furnace specialists. Write for a consultation.

WRITE for your copy of the latest Swindell Electric Melting Furnace Catalog — sent promptly on request.

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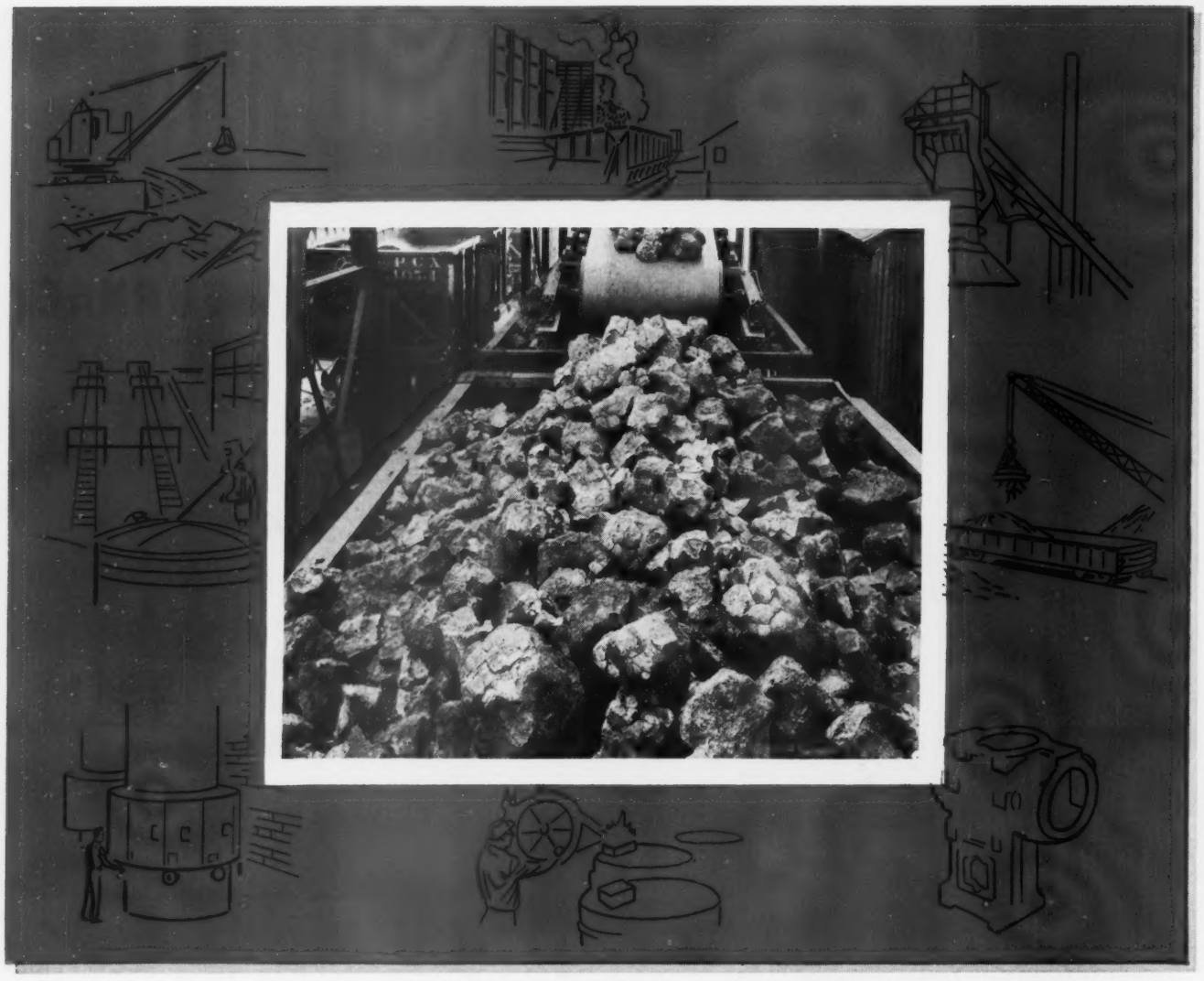
CORPORATION
Designers and Builders of Modern Industrial Furnaces
PITTSBURGH 30, PA.



NEVILLE FOUNDRY COKE means *Assured Quality*
From Coal to Castings

When we talk about *assured quality* in coke, we like to be specific. In the first place, Neville Foundry Coke is carefully processed from clean, washed coals which contain a high percentage of Pocahontas. This care, plus close scientific control of production, assures you of a coke that is stronger, denser and more uniform—with more fixed carbon and less ash and sulphur. In fact, we're so *sure* of the quality of Neville Coke that we *guarantee* it to meet your rigid specifications. This *quality-guarantee* is your assurance of maximum temperature at the nose of the tuyere and hotter, cleaner, more fluid iron.

As a merchant coke producer, operating four batteries of ovens, Pittsburgh backs up this guarantee of quality with a guarantee of reliable, continuing supplies . . . today and in the future. Wouldn't you like to enjoy these benefits in *your* foundry? Then specify *Neville* on your next coke order.

NEVILLE PIG IRON

NEVILLE COKE

Quality Products for the Foundry Trade

WSW 6035

COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

easy

TO GET A FULL LOAD

easy

TO DELIVER A FULL LOAD

with compact

TRACTOMOTIVE TL-6 TRACTO LOADER—

a high producer in confined areas

No ramming into pile to fill the half-yard bucket of the TL-6 Tracto-Loader. Operator lets the hydraulic torque converter do the crowding — smoothly, steadily . . . and there's a scooping action, too, with the tip-back bucket. You get a heaping load before the booms are halfway up.

On the go, the bucket holds the *full load* . . . has a 50-degree tip-back at only 3 feet above floor — means easier maneuvering, greater stability, better visibility.

Operator has an easy time handling the TL-6. No gear shifting — he just pulls or pushes a lever to change direction. Short, 6½-foot turning radius and over-all compact design make it easy to unload box-cars or travel through narrow aisles and doorways, make hairpin turns near columns and posts.

See the TL-6 in action. Let us make an appointment for you with your Allis-Chalmers Construction Machinery Dealer for a demonstration. Send coupon NOW.

Send For Free Descriptive Catalog
On The Complete Line Of Tracto-Loaders

TRACTOMOTIVE

TRACTOMOTIVE CORPORATION, DEERFIELD, ILLINOIS

TRACTOMOTIVE CORPORATION, Dept. F
Deerfield, Illinois

☐ Please arrange a demonstration of the TL-6
☐ Send catalog on Tracto-Loaders

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Most of the California sea lions are captured and shipped by the San Diego Zoo. Hundreds of them have been sent to circuses, zoos and theatrical training quarters all over the world. The training of sea lions calls for intensely patient work. For instance, it usually takes from six months to a year to teach them to balance a big rubber ball, their best known and favorite trick.

Performance..

The amazing tricks of the performing seal are familiar to most of us. But it's not generally known that *only* one species of seal possesses the intelligence necessary for such performance. This is the California sea lion, found off the coasts of Southern California and Lower California in Mexico.

Similarly, foundrymen seeking extraordinary performance in foundry flasks have been able to find it *only* in HINES FLASKS. Designed for efficient operation and built for rugged usage, HINES FLASKS outperform all other flasks. As a matter of fact, they'll surpass *any* type of foundry equipment in cutting costs.

So remember, it's no trick at all to get top performance in foundry flasks—just be sure to use HINES FLASKS.

Hines **FLASKS**

HINES POP-OFF FLASK

THE HINES FLASK CO.,

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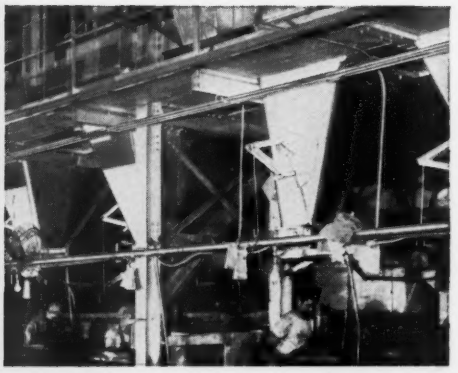
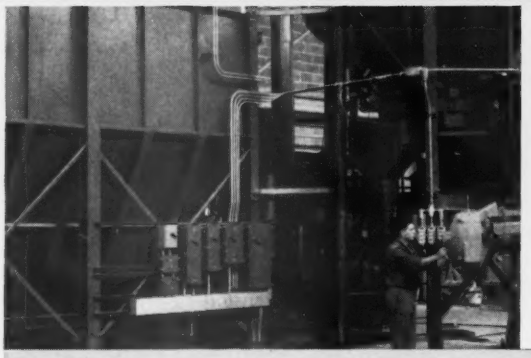
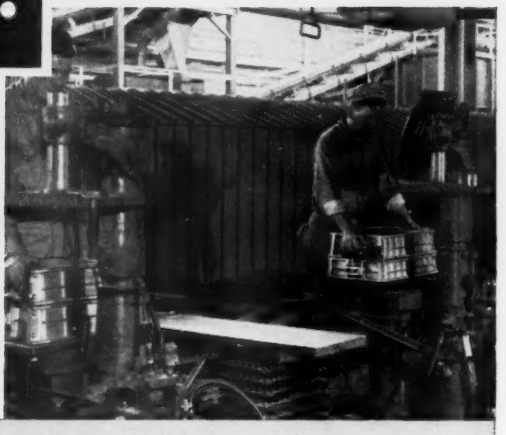
HUNDREDS OF FOUNDRIES CALL ON EXPERIENCED KNIGHT ENGINEERS FOR PRACTICAL, RELIABLE ASSISTANCE...







...ON VIRTUALLY ALL FOUNDRY PROBLEMS!

The key men in Lester B. Knight & Associates, Inc. have from 10 to 30 years successful experience in some phase of foundry management, production, engineering or equipment. The coordination of each man's specialized experience has enabled the Knight organization to complete hundreds of successful assignments in every type of foundry—grey iron, steel, malleable, brass and bronze, magnesium, and aluminum. These foundries are producing castings from a few ounces to 50 tons, and from 1 to more than 1,500 tons of castings per day. Green sand, dry sand, cement, plaster, "shell" molds, permanent mold, centrifugal, die casting and investment casting operations all have been served by Knight.

Working closely with clients' staffs, Knight Engineers have assisted its clients to audit operations, define management functions, establish organization, modernize methods and facilities, and design complete new plants. They have successfully applied automation in varying degrees to a number of different types of foundries, and have assisted management to establish more economical procedures for the control of operations and costs.

Your operation can benefit by this comprehensive experience. A letter will bring a call from a Knight representative at your convenience.

Write for Knight Bulletin No. 101, "Professional Foundry Engineering."

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Lester B. Knight & Associates, Inc.

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MEMBER OF THE ASSOCIATION OF CONSULTING MANAGEMENT ENGINEERS, INC.

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Foundrymen...

WHICH DO YOU PREFER?

DRY SAND RECLAMATION

WET SAND RECLAMATION

WE HAVE BOTH...

"AIR-RECLAIM & HYD-RECLAIM"

SOMETHING NEW IN SAND RECLAMATION!

SAVE MORE THAN 90%

OF YOUR WASTE SAND!

The savings to be realized through foundry sand reclamation are almost unbelievable. Many reclamation systems pay for themselves within the first year of operation. No foundry can afford to overlook the possibilities of sand reclamation.

IT'S THE SPIN THAT DOES THE JOB!
FOUNDRY SAND
AIR-RECLAIM
RECLAMATION EQUIPMENT
"Reclamation is our business NOT A SIDE LINE!"

CHECK WITH US...Booth #1438
Atlantic City Exhibit

We sincerely believe our organization to be best qualified to engineer a sand reclamation unit in your foundry.

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FOUNDRY SAND
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"Reclamation is our business ...NOT A SIDE LINE!"

"Reclamation is our business ...NOT A SIDELINE!"

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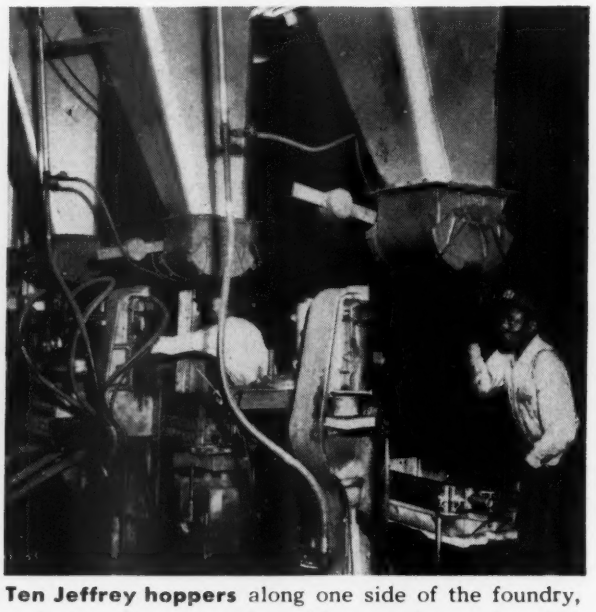
JEFFREY MECHANIZATION cuts costs

for handling and conditioning sand

at Forest City Foundries Company, Cleveland, Ohio

V-plows on overhead Jeffrey distributing belt conveyors, for diverting sand to molders' hoppers, are automatically air-operated. The two distributing conveyors and the cross conveyor move at 150 feet per minute; can handle 35 tons of sand per hour.



Ten Jeffrey hoppers along one side of the foundry, and nine along the other side, supply sand to the molders' stations. Hoppers are provided with 15" by 24" foundry-type clamshell valves.

Molds are poured on roller conveyors running between molding stations and shakeout conveyor. Poured molds are dumped onto this 65-foot Jeffrey vibrating conveyor, which shakes sand loose from the hot castings as they move along.

Castings and sand drop from this vibrating conveyor into the shakeout machine. Used sand is carried away by a Jeffrey apron conveyor, passed through cleaning and reconditioning equipment, after which it is elevated to storage by a Jeffrey bucket elevator. Now it's ready to start the circuit again.

Jeffrey can mechanize a complete foundry or a single operation. Write for Catalog 845. The Jeffrey Manufacturing Co., Columbus 16, Ohio.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT
TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

Shell molders...
for faster release, fewer rejects...

use DOW CORNING Silicone RELEASE AGENTS

Developed especially for the metal casting industry, Dow Corning *Silicone* parting agents assure clean, easy release every time with a minimum of build-up on even the most complex patterns. They reduce your cleaning costs to the vanishing point, and speed production of uniform shells. See for yourself — send for *free samples* today!

Water dilutable type

DOW CORNING 8 EMULSION

Widely approved by leading shell machine and resin manufacturers for applications where solvents cannot be tolerated. Noncorrosive and nonflammable, Dow Corning 8 Emulsion is easily diluted in hard or soft water . . . resists creaming or separation, both after dilution and in storage.

New solvent type

DOW CORNING F-452 FLUID

One application of this new, easily diluted solvent type silicone parting agent provides easy release for several resin-sand shells. Easily applied to either hot or cold patterns . . . wets surface rapidly . . . leaves uniform silicone film that's heat-stable and oxidation resistant.

NOTE **— for best pattern break-in, use Dow Corning 7 Compound.**

send for FREE SAMPLE!

1955 AWARD CHEMICAL ENGINEERING ACHIEVEMENT

DOW CORNING CORPORATION
MIDLAND, MICHIGAN

Dow Corning Corporation
Dept. 5904,
Midland, Mich.

Please send me:
- ☐ Free sample of Dow Corning 8 Emulsion
- ☐ Free sample of Dow Corning F-452 Fluid
- ☐ Free sample of Dow Corning 7 Compound

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

Make shell molds faster... get more accurate castings... with RCI's

FOUNDREZ 7500

● You save — in *time*, in *labor*, in *materials* — when you make shell-molds with Reichhold's two-stage, thermosetting, powdered phenolic resin — FOUNDREZ 7500. You get castings so accurate that almost no machining is required . . . closely duplicating the actual pattern surface even in the most finely-detailed, thin-walled areas. Rejects are reduced to an absolute minimum.

When you produce shell-molds with FOUNDREZ 7500, curing is *faster*. This remarkable RCI resin takes extremely high oven temperatures, enabling you to turn out more molds per hour . . . molds of uniform superiority. They're structurally stronger, better able to vent gas, freer from distortion.

For large and small parts cast with any ferrous or non-ferrous material, shell-molding with FOUNDREZ 7500 is ideal, particularly for long production runs. RCI offers technical help. Get complete data by writing for Technical Bulletin F-3.

RCI

Creative Chemistry . . .
Your Partner
in Progress

The foundryman unclamps the pattern plate from the dump box. Notice the thin shell of partially-cured FOUNDREZ 7500 and sand clinging to the plate.

REICHHOLD

Synthetic Resins • Chemical Colors • Plasticizers • Phenol
Glycerine • Phthalic Anhydride • Maleic Anhydride • Sodium Sulfate
Sodium Sulfite • Pentaerythritol • Pentachlorophenol

REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N. Y.

For more information, use Reader Service Card, page 187

Pangborn Rotoblast Table-Room at Worthington Corporation, Holyoke, Mass., "reduced two full shifts to one shift daily . . . gives perfect finish, cleans 2½ times faster than previous equipment."

Pangborn Rotoblast® gives "perfect" finish at Worthington Corporation!

And "cleans cleaner than pickling acid" at Brydon Brass!

Rotoblast Blastmaster® Barrel at Brydon Brass Mfg. Co., Toronto, Canada, "cleans cleaner than pickling acid . . . we're enthusiastic and completely endorse the cleaning quality."

Industrial parts today must have a high quality finish for many reasons—production facility, operating efficiency, consumer demand. Pangborn Rotoblast gives such a finish—thoroughly cleaned, uniform—and does it *quickly.* As a result, you get a top-notch cleaning job and greatly increased production with lower operating, labor and reject costs. Write for further details to see what Rotoblast can accomplish for *you.* Send for Bulletin 227 to PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

Visit "Pangborn Institute" at AFS SHOW, ATLANTIC CITY, May 3 to 9

Pangborn

BLAST CLEANS CHEAPER

Rotoblast Blastmaster® & Continuous-Flo Barrel

Rotoblast Tables & Table-Rooms

Special Blast Rooms & Cabinets

Pangborn Dust Control Equipment

Malleabrasive® Shot & Grit

Distributors for Malleabrasive and Tru-Steel Abrasives

TURN OUT

800-1200 LBS. OF COATED SAND PER HOUR

WITH THIS LOW COST

NATIONAL Shell-Mull Unit!

You get . . .

- **CONTROLLED COATING**
- **LOWER EQUIPMENT COSTS**

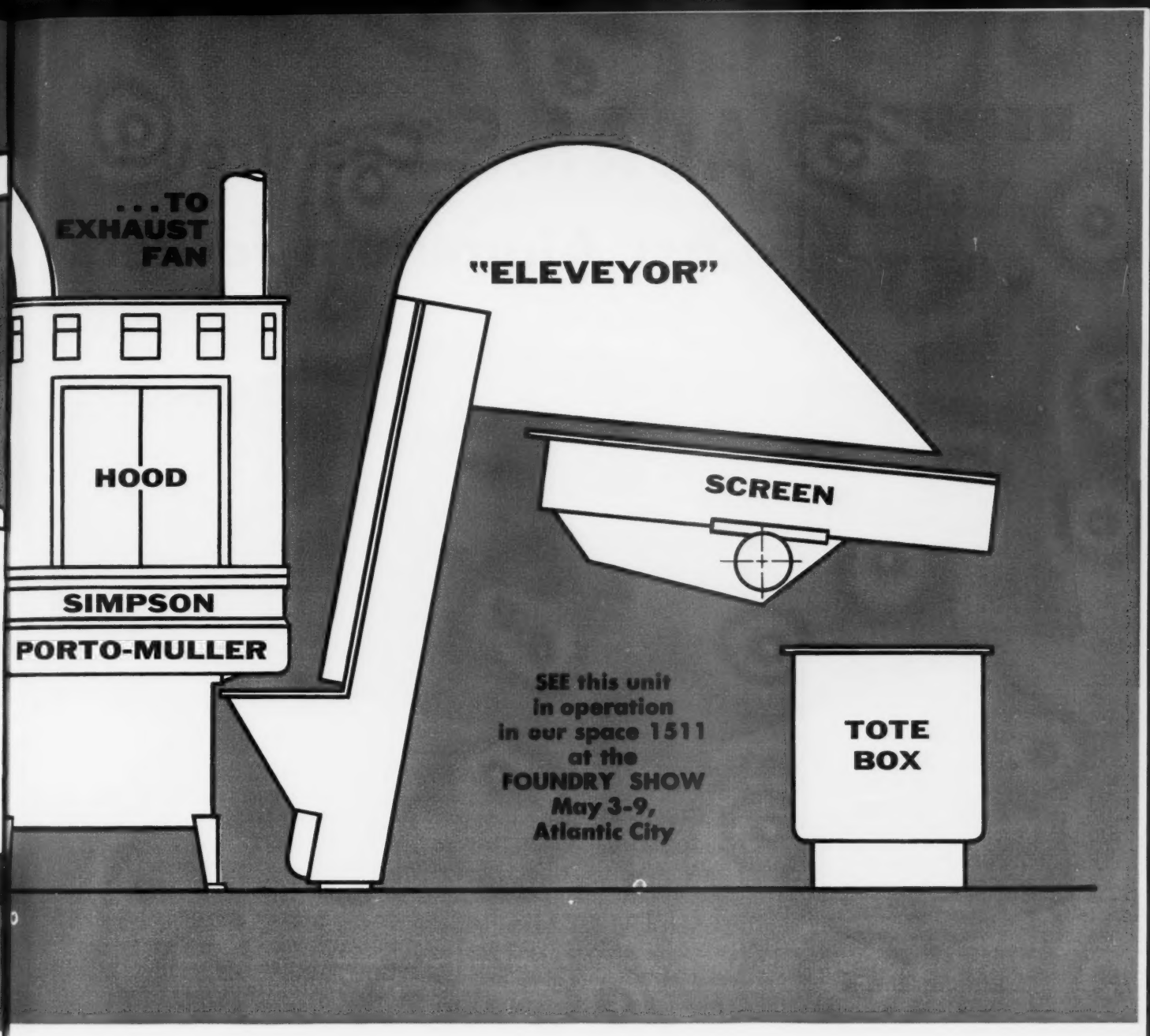
and you can . . .

- **USE YOUR PRESENT SIMPSON MIX-MULLER**

Standard Porto-Muller (wheels removed) Handles 200 to 250 lbs. of coated sand per batch.

This simple, completely practical, standardized unit will turn out 800 to 1200 lbs. of coated sand per hour—every hour, with a Simpson Porto-Muller!—The same packaged deal is available for *any* Simpson Mix-Muller too! You can handle up to 4000 lbs. per batch with a 3F Mix-Muller. And if you now have a Simpson you can use it—*without* beefing up the drive.

Yes, National again proves its leadership in *progressive* foundry equipment planning with a *practical* coated sand unit. Be sure to see it, in action, at our operating exhibit in Atlantic City May 3 thru 9.



These features mean increased hourly production with positive control over coated sand.

UNIFORMITY from batch to batch. Equipment design reduces sensitivity to variation in mixing time, temperature, etc.

LARGE BATCH reduces percentage of error due to slight variations in sand and resin weight. Hot air addition results in shorter mixing cycle.

LOWER OPERATING COSTS. Standard motor and drive used on all Mix-Mullers. You use less power and get longer part life.

SEPARATE HEATER gives positive control of sand and air temperature—*independent of muller cycle time.*

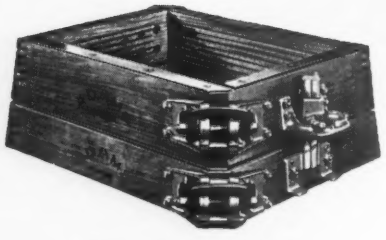
UNIFORM COATING. Proven mulling action does not heat sand. Increased tensile strength can mean you use less resin to get *better* physical properties.

National Engineering Company

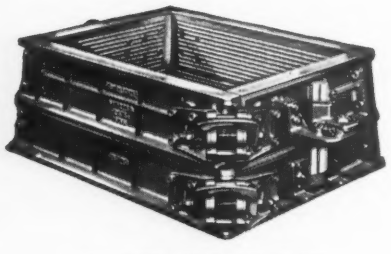
646 Machinery Hall Bldg. • Chicago 6, Illinois

REDUCE YOUR COSTS

ADAMS Cast Iron or Cast Aluminum Jackets



CHERRY EASY-OFF FLASK



ALUMINUM EASY-OFF FLASK

Look at these features and you'll agree that the Adams line can mean economy, efficiency, and better molds for your foundry.

Above is the Adams jacket available in either cast iron or cast aluminum. They are cast from a top grade metal mixture best suited for their purpose. The sturdy construction as a result of the vertical ribs inside and horizontal ribs outside plus the handles at either end assure you of long life for this equipment and ease in handling. These jackets afford you MAXIMUM STRENGTH and MINIMUM WEIGHT.

Here are jackets that assure you perfect mold fit—will give you the greatest strength while under pouring strain—allow for free flow of gases all because of INSIDE CORRUGATIONS. These VENTILATED jackets are first choice in foundries across the nation.

Look into the advantages cast iron or cast aluminum can offer you depending upon your foundry needs. We will be happy to make recommendations to fill your requirements.

For the most complete line of flask equipment available . . . always look to Adams!

The ADAMS Company

ESTABLISHED 1883

MOLDING MACHINES and FLASK EQUIPMENT

700 FOSTER STREET, DUBUQUE, IOWA, U.S.A.

For more information, use Reader Service Card, page 187

Late News

BUSINESS STEADY: March survey of the National Association of Purchasing Agents indicates an even pace of general business. Reports on production and orders show little change from those for February. The survey points to an acceleration in the upturn in material prices, with ferrous and nonferrous metals leading the way. A slight increase in employment is expected to be broadened seasonally in coming weeks, while the shortage of skilled workers will persist. Inventories are a trifle higher, with policy affecting forward buying little changed.

BIDS FOR CWC: Directors of Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., have approved the sale of the company to Textron American Inc., for $15½ million, subject to approval by stockholders. CWC would become a division of Textron with no changes in policy, personnel or general management. Textron American was formed about a year ago by the merger of Textron Inc., American Woolen Co. and Robbins Mills Inc. Since then it has diversified its operations widely.

MANGANESE PRICES UP: Price increases averaging 3.6 per cent have been announced on manganese alloys by Electro Metallurgical Co. They were effective Mar. 14 on a spot basis and Apr. 1 for contract users. The increase in standard ferromanganese is 4.9 per cent and on ferromanganese briquets it is 4 per cent.

SFSA ELECTS: Howard F. Park Jr., vice president, sales, General Steel Castings Corp., Granite City, Ill., was elected president, Steel Founders' Society of America, at the annual meeting in Chicago, Mar. 19-20. George W. Myers, president, Crucible Steel Casting Co., division of Consolidated Foundries & Mfg. Corp., Milwaukee, was elected vice president and Royal G. Parks, treasurer, National Malleable & Steel Castings Co., Cleveland, was reelected treasurer.

Robert C. Wood, president, Minneapolis Electric Steel Casting Co., was awarded the T and O medal of the Steel Founders' Society at the annual meeting. Frank X. Hohn, chief metallurgist, Scullin Steel Co., won the Gustav A. Lillieqvist *Steel Foundry Facts* award for his paper, "The New Look in Heat Treating Cycles" and Earle Layman, General Steel Castings Corp., Granite City, was presented a special award for his excellent work in safety.

ACCIDENTS RISE: Preliminary reports by the Bureau of Labor Statistics indicate that the injury frequency rate in foundries increased slightly in 1955. Data for the first nine months show that the frequency rate for all manufacturing was unchanged from the 1954 rate of 12.1. The rate for gray iron and malleable iron foundries, however, rose from 26.5 to 29, while that for steel foundries was up from 18.6 to 19.3 and for nonferrous foundries from 18.6 to 20.1.

INTERNATIONAL SPEAKER: Charles W. Briggs, technical and research director, Steel Founders' Society of America, will represent the society and present a paper on the production of large steel castings in green sand molds at the International Foundry Congress, Dusseldorf, Germany, Sept. 1-9.

FOUNDRY EXPANSION: Ohio Brass Co. plans to spend $1¼ million in expansion of its foundry and construction of an additional building at its Mansfield, O. plant. This is part of a $3 million expansion program at its three plants.

BRITISH OUTPUT UP: Production of iron castings in Great Britain during 1955 totaled 3,925,070 tons, according to the Iron and Steel Board. This compares with 3,742,490 tons in 1954.

PERSONALS: A. J. McDonald, vice president of American Steel Foundries with headquarters at Washington, will retire Apr. 1. Immediate past president of the Steel Founders' Society of America, he will represent that organization in Washington . . . Adam J. Kafka has joined Sutter Products Co., Dearborn, Mich., as sales engineer. He was formerly with

Beardsley & Piper Division, Chicago . . . Ahti A. Erkkinen, recently superintendent, foundry and pattern shop, Fremont Casting Co., Worcester, Mass., has been made general manager . . . Dr. John G. Thompson, chief, Metallurgy Division, National Bureau of Standards, Washington, has retired . . . Merlin H. Birk, formerly executive vice president, Waukesha Foundry Co., Waukesha, Wis., has joined A. T. Kerney & Co., Chicago management consultants . . . Joseph P. Crosby, vice president, Lapointe Machine Tool Co., Hudson, Mass., is the new director, Metalworking Equipment Division, BDSA, Washington.

NEW FOUNDRY: Conversion of an idle plant at Ashtabula, O., into a foundry is planned by State Metal & Steel Co., Canton, O. The plant, built by the government in wartime, has been idle since 1952. State Metal was high bidder at $420,000 when the property was auctioned recently.

TO JOIN NFS: Herbert F. Scobie, editor, *Modern Castings*, will leave that publication during the summer to become field manager of the Non-Ferrous Founders' Society, Chicago.

PIG IRON UP: An increase of $1.50 a ton in prices of foundry grades of pig iron was announced at press time in a number of areas. Likelihood is seen of a similar advance in other districts. Pending such action, the quotations shown in the table below are prices applying previously at all basing points.

NEW CHAPTER: Directors of the New England Foundrymen's Association voted on Mar. 14 to affiliate with the American Foundrymen's Society and to make application for the establishment of a New England Chapter. This would make the 45th chapter of the AFS.

MISCELLANY: February production of primary aluminum totaled 132,762 tons, against 140,393 tons in January and 116,236 tons a year ago . . . Indiana Steel Products Co. of Canada Ltd. has bought the Hayward Tyler Foundries Co., Kitchener, Ont. . . Norton Co. will mark the formal opening of its new Santa Clara, Calif., plant with an open house, May 7-9 . . . February orders for industrial furnaces were 116 per cent larger than a year ago, the Industrial Heating Equipment Association reports.

Prices of Foundry Metals and Coke

(As of March 23, 1956)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$16.00-17.00
OVEN	
Birmingham	$25.65
Buffalo	27.50
Chicago	27.00
Detroit	27.50
Erie, Pa.	27.50
Indianapolis	26.75
Kearny, N. J.	26.75
Lone Star, Tex.	19.50
Milwaukee	27.50
Montreal, Que.	28.50
Neville Island (Pittsburgh)	26.25
New England, deld.	28.55
Painesville, O.	27.50
Philadelphia	26.50
St. Paul	26.50
Swedeland, Pa.	26.50
Terre Haute, Ind.	26.75

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$61.00	$61.50
Birmingham	55.00	....
Buffalo	59.00	59.50
Chicago	59.00	59.00
Cleveland	59.00	59.00
Duluth	59.00	59.00
Erie, Pa.	59.00	59.00
Everett, Mass.	65.00	63.00
Fontana, Calif.	62.50	....
Geneva, Utah	59.00	....
Granite City, Ill.	60.90	61.40
Lone Star, Tex.	55.00	....
Neville Island (Pittsburgh)	59.00	59.00
Steelton, Pa.	61.00	61.50
Swedeland, Pa.	61.00	61.50
Toledo, O.	59.00	59.00
Troy, N. Y.	61.00	61.50
Youngstown, O.	....	59.00

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 44.00; tin bronze, No. 225, 58.00; No. 245, 50.75; high-leaded tin bronze, No. 305, 47.75; No. 1 yellow, No. 405, 34.75; manganese bronze, No. 421, 39.25.

ALUMINUM: 99 per cent plus primary ingots 24.40. Secondary No. 12 alloy 29.00. Deoxidizing grades: No. 1 29.75-30.25; No. 4 27.50-28.50.

MAGNESIUM: 99.8 per cent notched ingots 33.25, f.o.b. Freeport, Tex. (10,000 lb or more).

COPPER: Electrolytic 46.00 delivered Connecticut valley.

ZINC: High grade 14.85 delivered. Die casting alloy No. 3, 18.00 delivered.

IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$37.00-38.00	**$47.50-48.00	.....	.....	.....	.....	$60.00-61.00
Boston*	**40.00-41.00	**40.50-41.00	.....	.....	**42.00-43.00	.....	.....
Buffalo	47.00-48.00	**48.00-49.00	.....	.....	**51.00-52.00	.....	64.00-65.00
Chicago	48.00-51.00	48.00-49.00	.....	53.00-54.00	53.00-54.00	60.00-61.00	65.00-67.00
Cincinnati*	**49.00-50.00	**46.00-47.00	**43.00-44.00	.....	**55.00-56.00	.....	**66.00-67.00
Cleveland	52.00-53.00	54.00-55.00	46.00-47.00	54.00-55.00	55.00-56.00	60.00-61.00	70.00-72.00
Detroit*	**45.00	**43.00	**35.00	**46.00	.....	**42.00	.....
Los Angeles	42.00	**46.00	.....	.....	.....	.....	.....
New York*	44.00-45.00	42.00-43.00	46.00-47.00	.....	.....	.....	.....
Philadelphia	51.00	49.00-50.00	53.00	.....	55.00	68.00	.....
Pittsburgh	.....	.....	.....	.....	.....	.....	.....
St. Louis*	40.50	47.00	39.00	48.00	.....	.....	67.00
San Francisco	36.00	45.00	36.00	45.00	50.00	.....	.....
Seattle	38.00	**40.00	**33.00	35.00	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

Get ALL THESE 12 ADVANTAGES IN ONE READY-TO-USE CORE PASTE

LYQUAGRIP*

1. Ready mixed, uniform at all times
2. Light Colored, odorless, non-corrosive, non-fermenting
3. Dries rapidly at room temperatures
4. Unaffected by normal storage
5. Will not boil or blister
6. No appreciable gas generation
7. Pasted joints are stronger than core
8. Unaffected by mold humidity
9. For pasting CO^2 cores
10. Extra strong, uses 1/3 to 1/5 as much paste
11. Cores may be reheated without damaging pasted joints
12. Washes off hands and tools easily with warm water

* Trade Mark Reg.

Send for Literature

Whitehead Brothers COMPANY

Established 1841

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324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
17 Exchange Place, Providence, R. I.

Manufacturers of

LYQUAFLOUR
For cleaner surfaces, better shakeout

JOINT SEAL
Plastic compound for perfect sealing

LYQUAFACE
The liquid sand grain coating

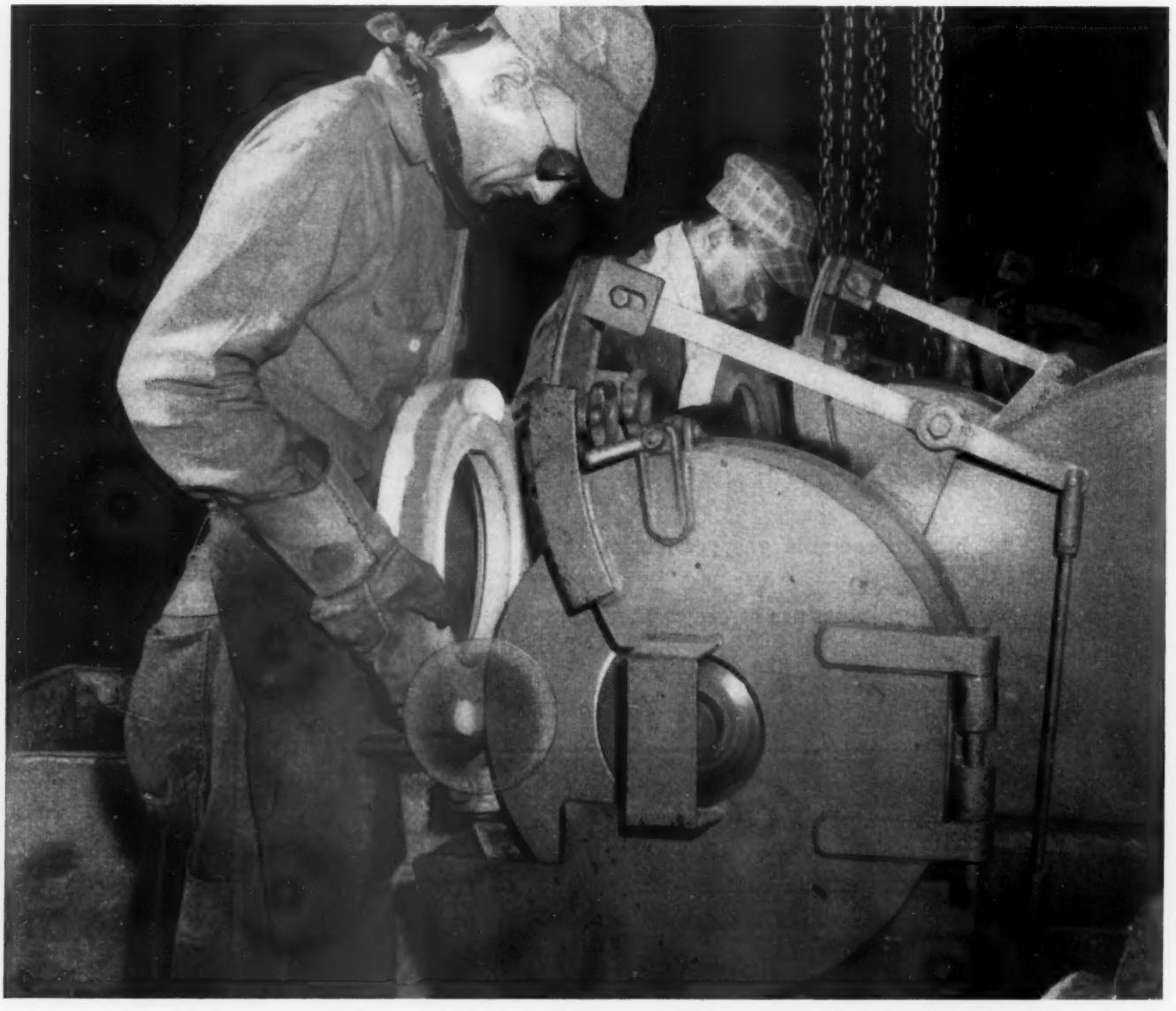
DOB-IT
Ready-to-use core mudding compound

For more information, use Reader Service Card, page 187

3 Great Wheels for Non-Ferrous Grinding

Norton ALUNDUM* resinoid, CRYSTOLON* vitrified and BN wheels cover a wide range of soft-metal applications . . . adding the profit-boosting

"TOUCH of GOLD"



A Norton CRYSTOLON Vitrified Wheel **combines the abrasive and bond that make grinding this bronze casting an easier, more economical job. There's no better wheel for grinding brass and bronze on any type of machine.**

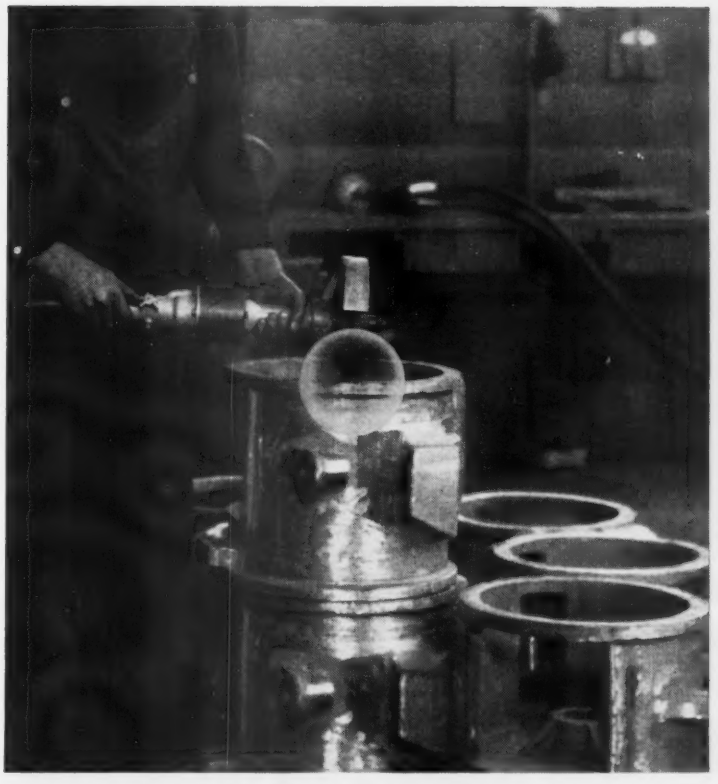
The most reliable way you can gauge any grinding wheel's value is by its *grinding quality* — the factor which takes into consideration *both* wheel cost and labor cost.

Continuous research and testing by Norton, together with many job-reports from non-ferrous foundries, prove that for three important types of soft-metal grinding there are three types of Norton wheels with exactly the right grinding quality to provide best performance at lowest cost. As follows:

For Grinding Bronze and Brass, Norton CRYSTOLON vitrified wheels wear at just the right rate to assure the grinding quality that means more grinding for less money.

For Grinding Aluminum, Norton ALUNDUM resinoid wheels offer the abrasive-and-bond combination that means fastest, coolest cutting action plus longest wheel life.

For Cutting-Off and Notching gates and risers, Norton BN reinforced resinoid wheels combine unusually high resistance to breakage with fast cutting action and long wheel life.



A Norton ALUNDUM Resinoid Wheel, rough grinding aluminum castings, has the fast cutting action and long wheel life that add up to the ideal grinding quality for applications on this metal.

Your Norton Distributor

will be glad to help you select wheels that will add the cost-cutting, product-improving "Touch of Gold" to every grinding job, on every material and every type of machine. And remember: only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. Write for booklet "Rough Grinding" to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

W-1694

A Norton BN Reinforced Resinoid Wheel is not only useful for cutting-off and notching gates and risers but for light snagging and many other jobs. It's one of industry's safest, longest-lasting cut-off wheels.

NORTON
ABRASIVES

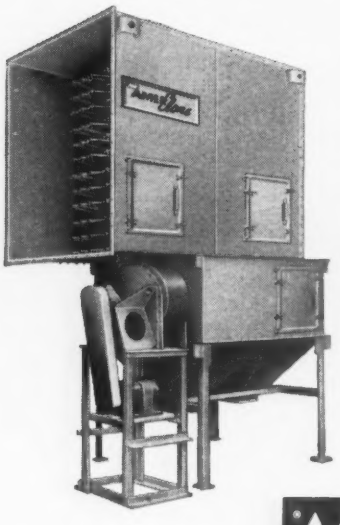
*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels
Grinding Machines • Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives
Sharpening Stones • Pressure-Sensitive Tapes

NOW..
POSITIVE CUPOLA DUST CONTROL



AAF AMERclone

Removes the SMALL Particles that create BIG Problems

JUST "cinder-catching" coarse particles that would settle on the foundry roof falls far short of solving the real cupola stack gas problem. AMERclone, designed originally for boiler fly ash, eliminates the *fine* particles that often settle on parking lots and the surrounding neighborhood.

One AMERclone system handles two cupolas alternately . . . permits full-time utilization of equipment. Dust and cinders are collected dry. This facilitates disposal and prevents corrosion on the collection system. And AMERclone maintains its efficiency over widely fluctuating gas volumes.

Another AMERclone plus: metallic fume after-cleaner can be added at any time local conditions may require it. For complete information, call your local AAF representative or write direct for product Bulletin 291.

SEE MODEL SYSTEM at the FOUNDRY SHOW booths 1309-1311

Make a note, now, to visit the AAF exhibit and see a detailed model of the AMERclone system and actual installation operating data.

AAF American Air Filter
COMPANY, INC.
266 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

Eye Protection

3 Types of AO® Engineered Eye Protection For Foundrymen who Want the FINEST!

482 Flexible Mask Goggle — Note all the apertures in the mask permitting air entry to help keep a foundryman cool! Yes, and the goggle's light in weight — fits the features comfortably. This goggle can be worn over most types of personal glasses or Safety R glasses (it's extra wide and has ample clearance). The interchangeable one-piece acetate lens is optically correct (like all AO lenses) and gives the worker security against flying particles. Field of vision is exceptionally wide. Elastic headband is quickly adjustable. *Clear* Frame, Clear or Green Lens.

351A Air Conditioned Goggle — Here's the cup goggle for foundrymen who work in cramped places or wherever hot and humid conditions exist and quality protection from impact dangers is required. The AO engineered extension rings supply almost twice the usual ventilation without sacrifice of strength or impact resistance. Eyecups are shaped to fit contour of each eye — are low set for wide angle vision . . . have smooth rounded, snug-fitting edges . . . and won't conduct heat or electricity. (Note the side perforations for additional ventilation.)

Bridge is ball-chain type, insulated with tubing and quickly adjustable. Lenses are 50 mm. Super Armorplate or 6 Curve Super Armorplate clear or Calobar, medium, dark, extra dark. Headband is one-piece rubber, easily adjustable. Rubber cushions available around edge of eyecups at slight extra cost.

483 Flexible Mask Goggle

This goggle is identical with the "482" except that it has a Green Frame, with Clear or Green Lens

Your Nearest AO Safety Products Representative Can Supply You

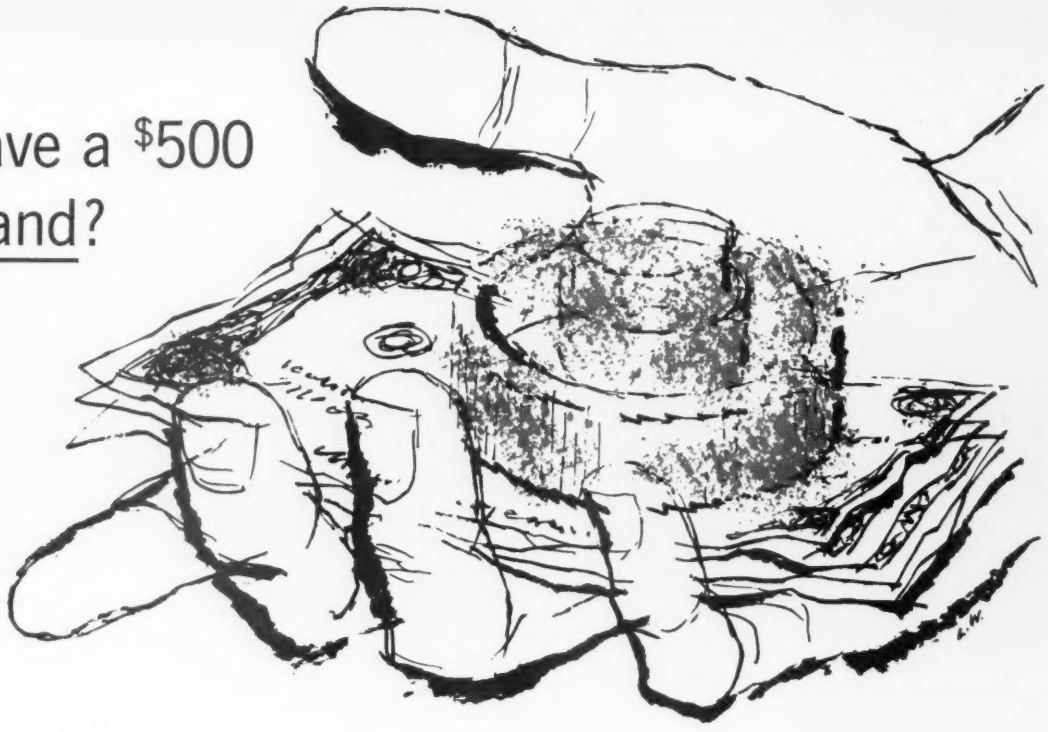
ALWAYS INSIST ON AO TRADEMARKED LENSES AND FRAMES

American Optical

SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

Do you have a $500 idea on hand?



enter it in the 1956 Gray Iron Redesign Contest

win . . .

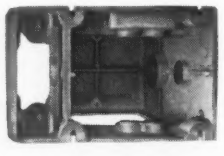
1st Prize $500.00
2nd Prize $250.00
3rd Prize $100.00

Select the best design, and the casting from this design, which you have *converted* from a competitive material to Gray Iron . . . *it may be worth $500 in prize money to you.* Tell us what it is and why you redesigned this product or part as a Gray Iron casting. Tell us which of Gray Iron's many features added to its efficiency or reduced costs to make the redesign practicable. *That's all you do!*

Entries will be judged on the basis of (1) ingenuity of design; (2) cost savings; (3) performance advantages; (4) value to the industry in widespread application. See the examples of previous winners shown below.

1955 WINNER!
This is an automatic valve. Redesign in Gray Iron saved 70% in production costs and eliminated a service problem.

1954 WINNER!
This screw nut originally was hogged out of bar stock. As a cored Gray Iron casting, it reduced costs by 83%.



1953 WINNER!
This Gray Iron machine base saved 50% over fabricated steel design. It also improved the appearance and added desired performance factors.

FOLLOW THESE EASY CONTEST RULES

1. Submit an 8″ x 10″ glossy photograph of the Gray Iron casting you wish to enter. If possible, also submit a photograph of the original design before it was converted to Gray Iron.

2. Write all the facts leading up to your design; such as why you thought of Gray Iron, how much was saved in labor and/or material costs, how much efficiency was gained. Give the facts that will tell us how the Gray Iron casting is working out better than the original design.

3. Mail the photographs and all facts about your redesign to: Redesign Contest, Gray Iron Founders' Society, Inc., National City-East 6th Bldg., Cleveland 14, Ohio. Your entry must be postmarked not later than July 1, 1956.

4. This contest is open to all persons engaged in the entire metal-working industry. Entries may be made jointly by two or more individuals. Awards will be made at the 28th annual meeting of the Society in Hot Springs, Virginia on November, 2.

WHY THE SOCIETY SPONSORS THIS CONTEST EVERY YEAR . . .

Part of the Society's marketing program is to uncover new ideas for Gray Iron castings which have been produced in this country's Gray Iron foundries.

The best ideas are usually thought of under the pressure of competition, such as when a foundry has to dig hard to offer improvements to existing products or parts in order to replace competitive materials. That's why we ask for *redesigns.*

The best casting designs are given adequate publicity. Then everyone interested in improving his products learns of Gray Iron advantages and can perhaps raise his own product standards by converting.

GRAY IRON FOUNDERS' SOCIETY

MAKE IT BETTER WITH GRAY IRON

GENERAL REFRACTORIES

LET'S GO...with BRICK

Pack your bag, jump in your car, board your ship, your train, your plane—join America on the go. And thank brick that you *can* go. Refractory brick that produces the concrete for your highway, the turbines for your ocean liner, the stainless steel for your streamliner, the wings for your plane.

Everything that's made or that moves owes its existence to the fires of industry contained by valiant walls of refractory brick—refractories which withstand enormous heat for days, for weeks, for years.

How great the heat to be mastered? Where? When? How long? These are the concern of the refractory scientist, and it is the mission of General Refractories Company to meet the requirements.

To do this job, General Refractories maintains the world's greatest refractories laboratory, draws on resources the globe around for materials, and makes and distributes exactly the right refractory to industry, everywhere.

A Complete Refractories Service

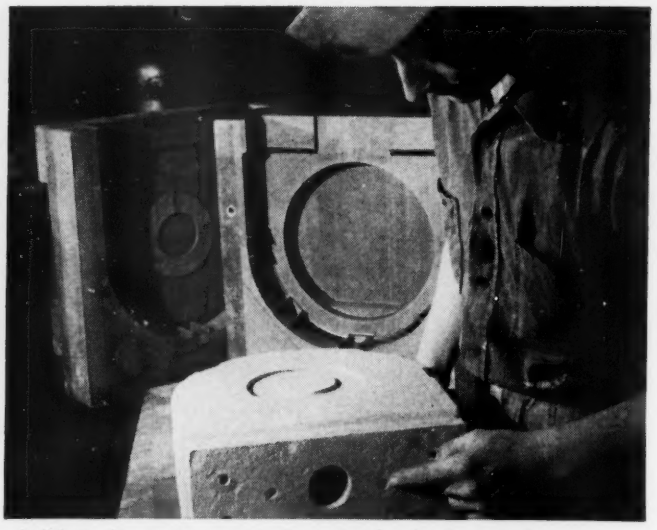
GENERAL REFRACTORIES COMPANY

Philadelphia 2

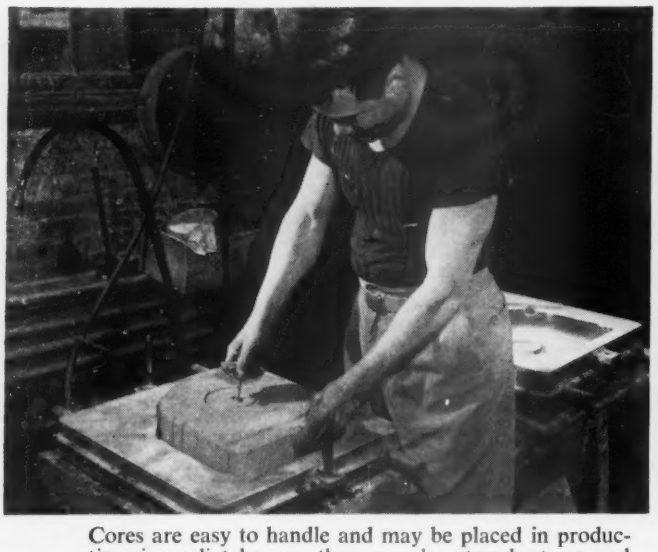
SEND FOR THE MOTION PICTURE: THE GREFCO STORY

It is a beautiful 16 mm. motion picture in full color and sound which relates the fascinating and little understood story about the refractories industry ... *the industry behind industry*. Viewing time is 26 minutes. If you would like to show it to executive, employee, social, church or other groups, a request on your letter head is all that is necessary. Address General Refractories, Philadelphia 2.

This process eliminates the use and cost of heavy equipment, and can be located anywhere in a foundry. It is ideal for shooting machines, shell molding and hand ramming.



Solid castings are assured. Cores harden in the core box and are not subject to deformation by handling and transporting. Extremely small tolerances can be maintained.



Cores are easy to handle and may be placed in production immediately, or, they can be stored at normal temperatures. Obnoxious fumes are eliminated. Sand recovery is excellent.

Production is incredibly fast. 30 to 50 cores, in a gang, can be hardened in seconds. Shell molding—usually complicated—is simple and inexpensive. Rejects caused by hot tear are reduced to a fraction.

Carbon Dioxide process hardens molds and cores in 5-to-15 seconds—eliminates ovens!

The carbon dioxide injection process is the first and only method of "baking" molds and cores without heat. Pureco CO_2 used in conjunction with specially prepared water glass binders can reward foundrymen with phenomenal savings in time, space, and capital investments while providing unprecedented flexibility. See your Pureco man for full information.

- **Eliminates baking ovens . . . saves time**
- **High dimensional stability of cores**
- **Fewer wires and core grids required**
- **No dry shells for cores**
- **Eliminates fumes when pouring**
- **Reduces rejects**

AT THE FRONTIERS OF PROGRESS YOU'LL FIND . . .

AN AIR REDUCTION PRODUCT

PURECO CO_2

Pure Carbonic Company

A Division of Air Reduction Company, Incorporated

General Offices: 60 East 42nd Street, New York 17, N. Y.

PURE CARBONIC COMPANY is a division of **AIR REDUCTION COMPANY, INCORPORATED** • Principal products of other divisions include: **AIRCO** — industrial gases, welding and cutting equipment and acetylenic chemicals • **OHIO** — medical gases and hospital equipment • **NATIONAL CARBIDE** — pipeline acetylene and calcium carbide • **COLTON** — polyvinyl acetates, alcohols and other synthetic resins.

Look at what's new
in faster yard service

New WHITING Heavy-Duty TRACKMOBILE®
Speeds Up Freight Car Switching, Spotting, Hauling!

The new Heavy-Duty Trackmobile lowers costs by keeping freight *on the move!* It easily pulls heavily loaded freight cars, expedites production, saves manhours. Exclusive design provides *both* road and rail utility . . . eliminates bottlenecks and clogged sidings. Ruggedly constructed, it provides continuous all-weather, day and night service with a minimum of maintenance.

The Heavy-Duty Trackmobile ends demurrage losses and wasted waiting time. It provides a *completely new efficiency* never before possible. It's powerful and dependable, does *big* jobs at *little* cost. Look to the Trackmobile for a new way to cut costs!

WHITING CORPORATION
15661 Lathrop Avenue, Harvey, Illinois
Manufacturers of CRANES • TRAMBEAM • FOUNDRY, RAILROAD AND CHEMICAL EQUIPMENT

The Trackmobile principle of operation has been proved in hundreds of applications in scores of industries!

Write today for the new Heavy-Duty Trackmobile Bulletin T-115. Indicate your particular car moving problems and we'll be glad to suggest ways the new Trackmobile will save you both time and money.

On rail wheels the Trackmobile pulls freight cars — moves to and from the track on road wheels. Use it to pull skids and carts when on road wheels.

LET'S LOOK at

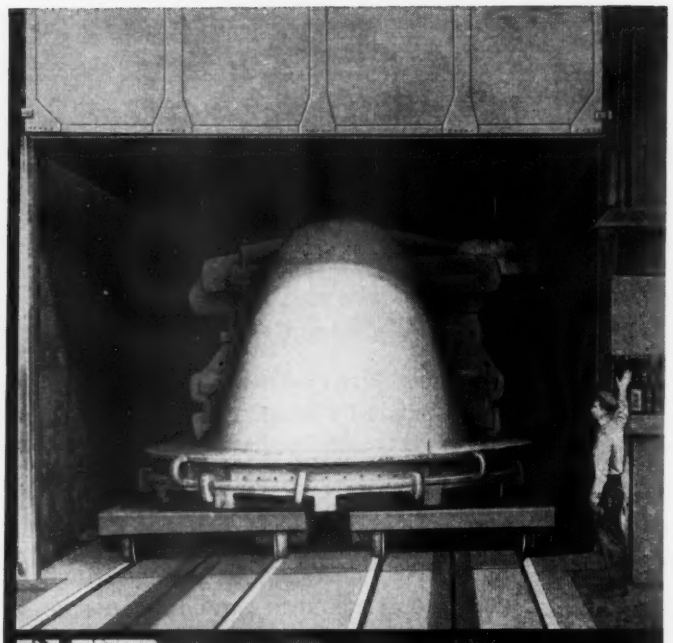
OVENS for every baking requirement

OVENS that will be faster and less expensive to operate

OVENS that are designed to best fit your operation

Carl Mayer designs and manufactures all types of ovens as well as "specials" to meet unusual operating conditions. Most incorporate the Carl Mayer recirculating heating system with sealed combustion chamber that keeps gases from prematurely escaping into the load area. Cores and molds are baked evenly with no burning. Temperatures are always under control.

Write for Bulletin 53-CM



TOP RIGHT—This large car type mold oven is installed at Pittsburgh Steel Foundry. Its special triple slotted panel construction reduces heat loss 1/3. Fuel savings up to 50% over old conventional methods are possible. Drying time is often cut in half and temperatures are uniformly controlled.

MIDDLE RIGHT—This rack type core baking oven is at the Fremont Foundry Co., Fremont, Ohio. It is equipped with a recirculating combination gas-oil fired heating system.

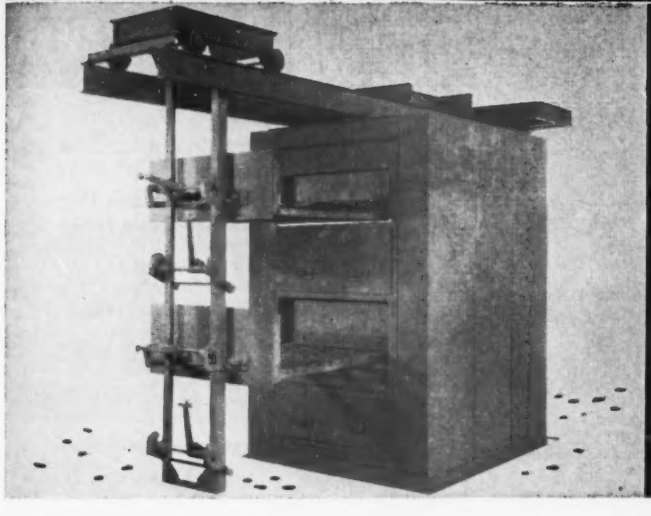
BOTTOM RIGHT—Vertical Core Oven (unloading position) at A. C. Williams Company, Ravenna, Ohio. This oven is 11'-0" wide x 11'-0" deep x 45'-0" high.

BELOW—Our standard rolling drawer type core baking oven. The heating equipment (not shown) may be mounted on floor beside unit or on the roof. Particularly adaptable to brass and aluminum foundries.

THE **carl mayer** CORP.

3030 EUCLID AVENUE CLEVELAND 15, OHIO

OTHER PRODUCTS: Heat Treating Ovens and Furnaces • Rod Bakers • Welding Rod Ovens • Paint and Ceramic Drying Ovens • Special Processing Equipment and Accessories



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BONDING CLAY

with

high dry strength

Let us furnish
a free sample
for your examination

FROM THE WORLD'S FINEST CLAY DEPOSITS

High refractory value, high green strength, high dry strength at high temperatures! For the bonding agent with greater durability and economy ask for, and insist on getting, Cedar Heights "Bond." Produced in No. 8, 12, 16, 20, 30, and 50 meshes.

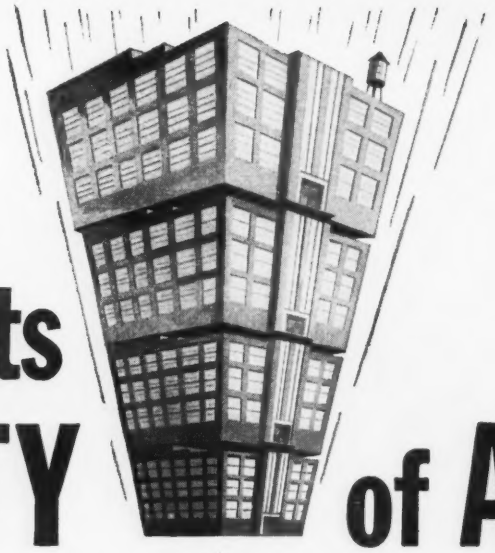
Makes a smooth, working sand and saves you money, too.

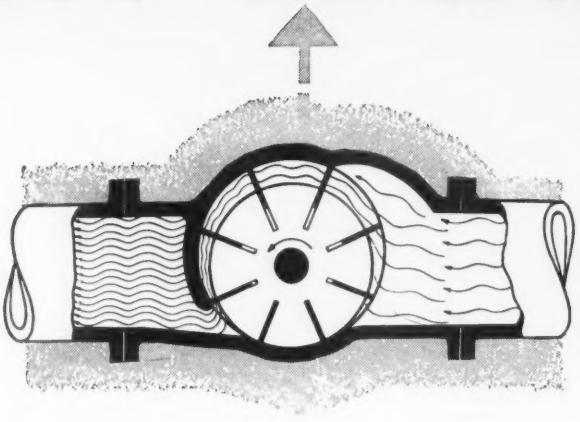
Can be shipped anywhere, anytime. See your distributor today.

CEDAR HEIGHTS CLAY COMPANY

50 PORTSMOUTH ROAD
OAK HILL, OHIO

Growing Plants need PLENTY of AIR!





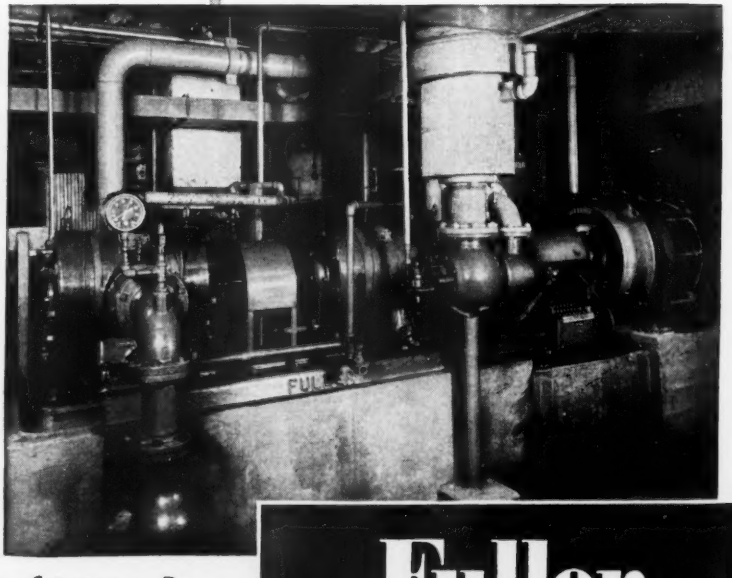
As abundantly demonstrated in thousands of successful installations, the simplest, most economical and most reliable source of compressed air for all pneumatic plant services is the Fuller vane-type Rotary Compressor.

This compressor has an irreducible number of moving parts—rotors, blades and bearings—and for this reason it is ideally adapted for continuous service in out-of-the-way locations without attention.

With direct-connected motor drive and operating with incredible lack of vibration, these compressors run for days on end without even being seen, much less inspected.

When you need such performance, it will pay you to specify Fuller Rotaries—for pressure up to 125 psig. and capacities to 3300 cfm.

Detailed information on design characteristics, and typical applications will be forwarded promptly on request.



FULLER COMPANY, 148 Bridge St., Catasauqua, Pa.

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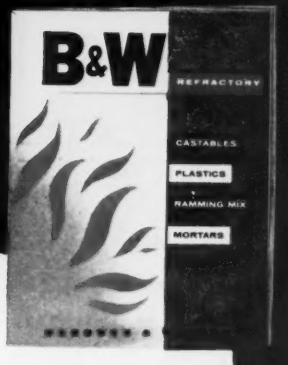
Fuller

. . . . pioneers in harnessing AIR

What are your refractory castable problems ?

- High Temperatures?
- Abrasion and Erosion?
- Slag Attack?
- Overhead Applications?
- Insulating Properties Required?

B&W makes a wide range of specialized refractory castables. Whatever your problem, you will find helpful data in B&W Bulletin R-35. Send for your copy today.



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THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 161 EAST 42nd ST., NEW YORK 17, N.Y.
WORKS: AUGUSTA, GA.

B&W REFRACTORIES PRODUCTS: B&W Alumal Firebrick • B&W 80 Firebrick • B&W Junior Firebrick • B&W Insulating Firebrick • B&W Refractory Castables, Plastics and Mortars • B&W Silicon Carbide

FIND THE CAUSE OF CRACKS

and you'll cut the COST of castings

With the black light of Magnaflux-Magnaglo, you can give a low cost check to each production step to find WHERE and WHY invisible cracks are being "built-in" your castings.

A high percentage of cracked castings doesn't just happen—there's always a reason. It may be in pouring, sprueing, shake-out, cleaning, handling, grinding or heat treating—even shipping.

But which step is at fault? why?

By answering these questions, non-destructive inspection with Magnaflux* can help you SAVE MONEY. By sample checking of the output from each production step, Magnaflux shows where the cracks *first* appear, helps you to find the faulty operation or process and suggests the remedy. Correction often involves only a minor change in production techniques. Result: production runs with almost no cracks.

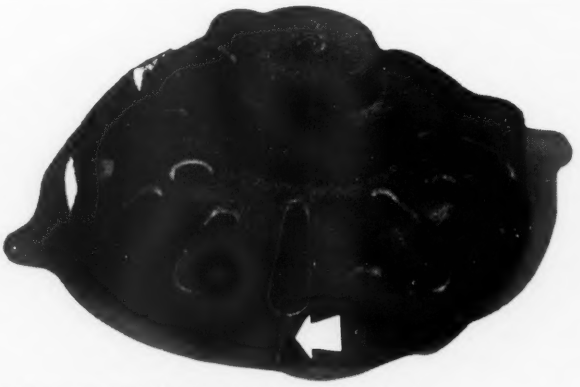
How much you can save with Magnaflux naturally depends somewhat upon your own operation. In practically every case Magnaflux can help you to turn out better castings *at greater profit per casting.* Ask to have a Magnaflux engineer give you the facts and figures! They're interesting and enlightening! Set the date now!

*Magnaflux is a registered trademark of the Magnaflux Corporation.

MAGNAFLUX

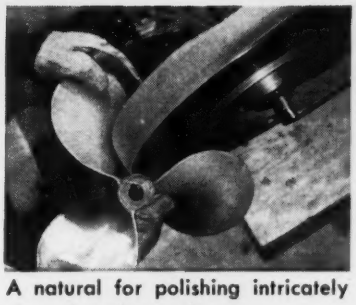
MAGNAFLUX CORPORATION
7350 West Lawrence Ave. • Chicago 31, Ill.

New York 36 • Pittsburgh 36 • Cleveland 15
Detroit 11 • Dallas 19 • Los Angeles 58



IMPROPER HANDLING CAUSED THIS CRACK
White line on bell-end casting for an electric motor is a Magnaglo indication of a crack. Sampling inspection with Magnaflux showed handling methods were consistently causing this crack. With the cause located, correction was simple — production of sound castings increased.

For the newest in coated abrasives . . . watch BEHR-MANNING!



A natural for polishing intricately shaped casting surfaces.

Favorites for bringing-up superior finishes in fast time.

Tops for removing flash from difficult inside contours.

Faster, easier way to finish non-ferrous castings

With these BEHR-MANNING Coated Abrasive Belts on the job, you'll come up with consistently better finishes every time. For example, this operator (above) turns out a steady flow of cast aluminum parts in record-breaking time.

Foundries everywhere are finding BEHR-MANNING Coated Abrasive Belts the answer for superior finishes at today's increased production demands. Try them yourself, in your foundry or at a nearby BEHR-MANNING Application Room. A BEHR-MANNING Representative will gladly demonstrate. Call him today, or write Behr-Manning, Troy, N. Y., Dept. F-4.

In Canada: Behr-Manning (Canada) Ltd., Brantford.
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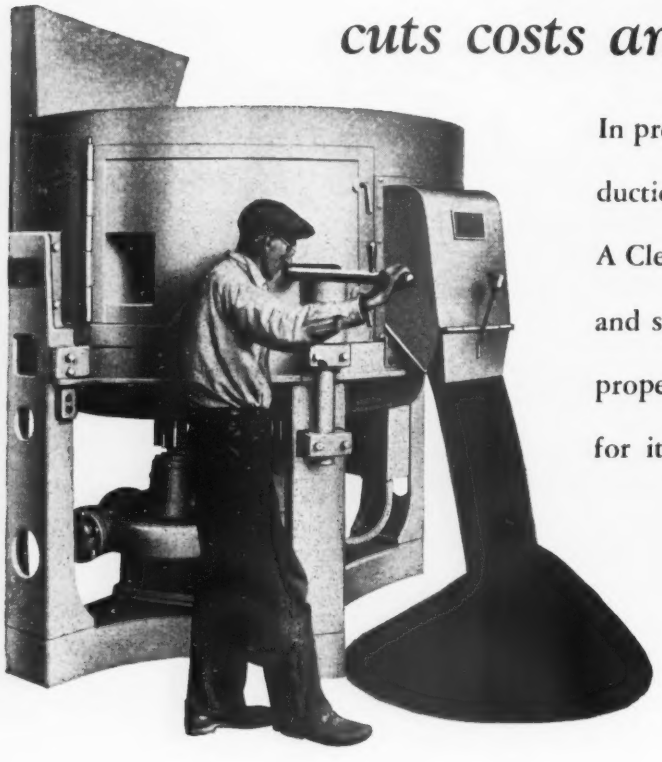
P-2

BEHR-MANNING® *division of NORTON Company*

▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE-SENSITIVE TAPES

the *Clearfield* mixer



cuts costs and speeds production

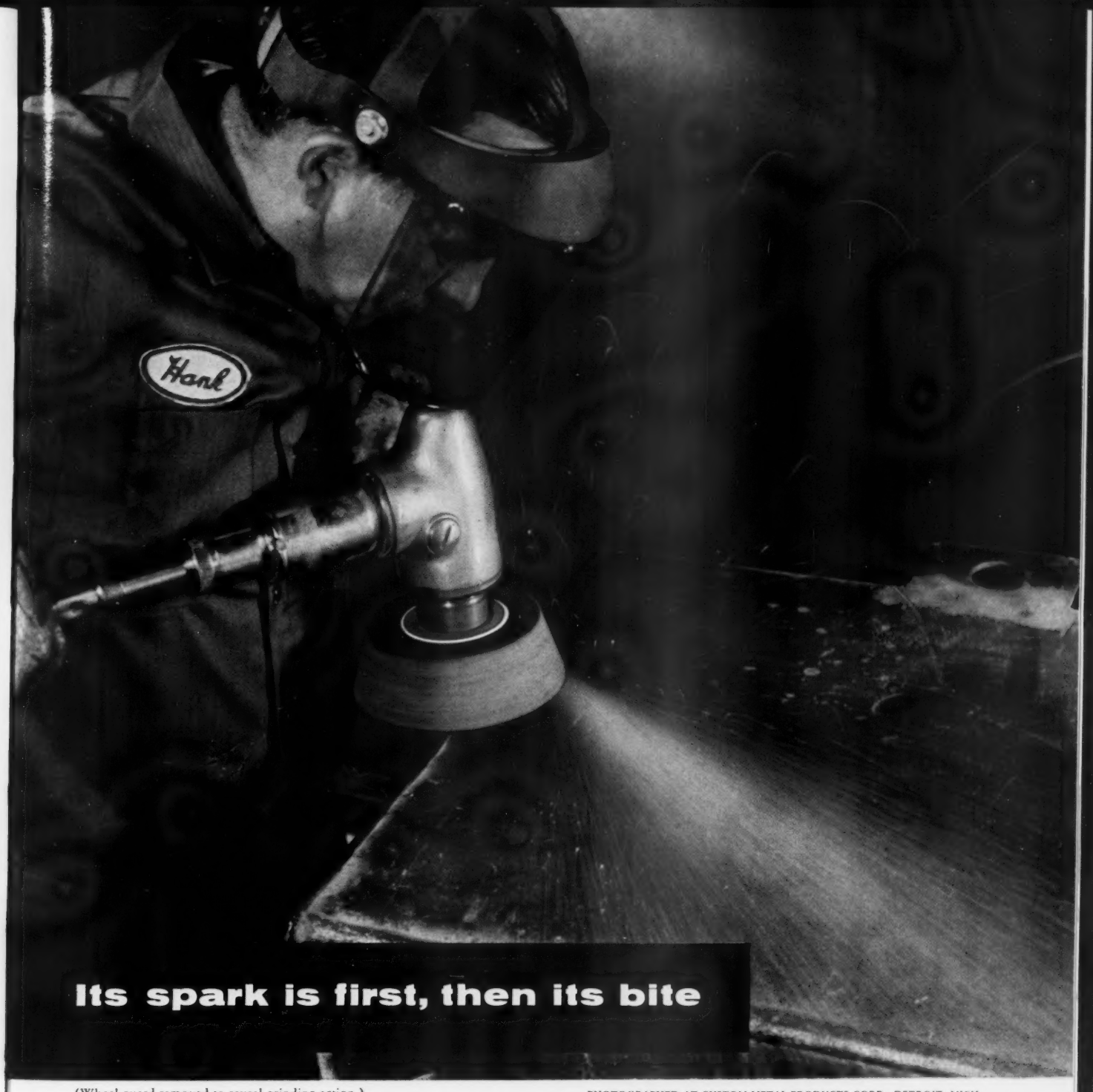
In preparing foundry sand, if you can speed production and maintain high quality *you cut costs.* A Clearfield Mixer, with its speed, dependability and special mixing features, prepares your sand properly and exactly as you want it, thus paying for itself many times over.

Write today for Catalog No. 83. Clearfield Mixers are available in many sizes to meet every need.

CLEARFIELD
MIXER

fast,
thorough
sand preparation

CLEARFIELD
MACHINE COMPANY
CLEARFIELD
PENNSYLVANIA, U. S. A



Its spark is first, then its bite

(Wheel guard removed to reveal grinding action.)

PHOTOGRAPHED AT CUSTOM METAL PRODUCTS CORP., DETROIT, MICH.

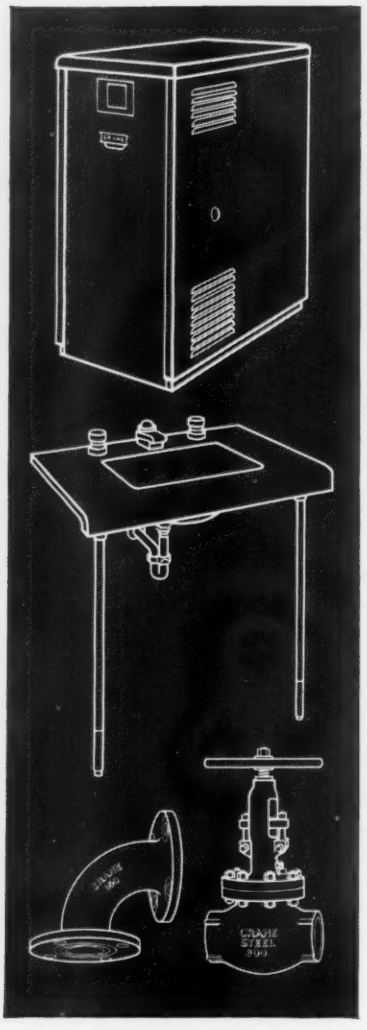
The portable grinding of weld beads demands a wheel that can take it. This B7 Bond Resinoid Cup Wheel, for instance, is built to chew through the heaviest welds you'll find. In fact, for all your rough grinding and snagging on castings and forgings, whether steel or non-ferrous, your best bet is a portable wheel by CARBORUNDUM. They're made in both aluminum oxide and silicon carbide, specially bonded to give maximum strength and safety even on severest applications. And they maintain their high initial rate of cut for the life of the wheel...give highest production at lowest abrasive cost. A good man to see is your CARBORUNDUM Distributor or salesman. He'll recommend the best wheel for every portable grinding job in your shop. Call him today, or write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

Through application "know-how" and product quality

CARBORUNDUM

REGISTERED TRADE MARK

continually puts more sense in your abrasive dollar



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says **FRANK F. ELLIOTT** President, Crane Co.

"We sell more than 40,000 products in dozens of markets," continues Mr. Elliott, "and to keep our sales curve healthy we need up-to-date facts upon which to base decisions. That's the reason we read business publications *regularly* – advertisements as well as news."

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Write for a list of the NPB publications and the "Here's How" booklet, "How Well Will We Have to Sell Tomorrow?", written by Ralston B. Reid, Advertising & Sales Promotion Manager of the Apparatus Sales Division, General Electric Company.

On the fence about CORE OIL?

There's never a doubt when you use

SMITH L-O

With Smith L-O on the job, you can cast doubts aside when you're casting. How come? Well, first of all, Smith L-O has a guaranteed uniformity and incomparable quality that means better, finer castings — *for sure.* Secondly, when you use Smith L-O you can use the grade that is based on the recommendation of a Smith Foundry Serviceman. His "shirt-sleeve" training qualifies him to analyze your specifications and then come up with the right answer for you. Forget sitting on the fence when it comes to purchasing core oil. Look first to Smith L-O . . . *the name that stands for a service as well as a product!*

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SMITH OIL & REFINING CO.

MANUFACTURERS OF L-O AND CERTIFIED CORE OILS
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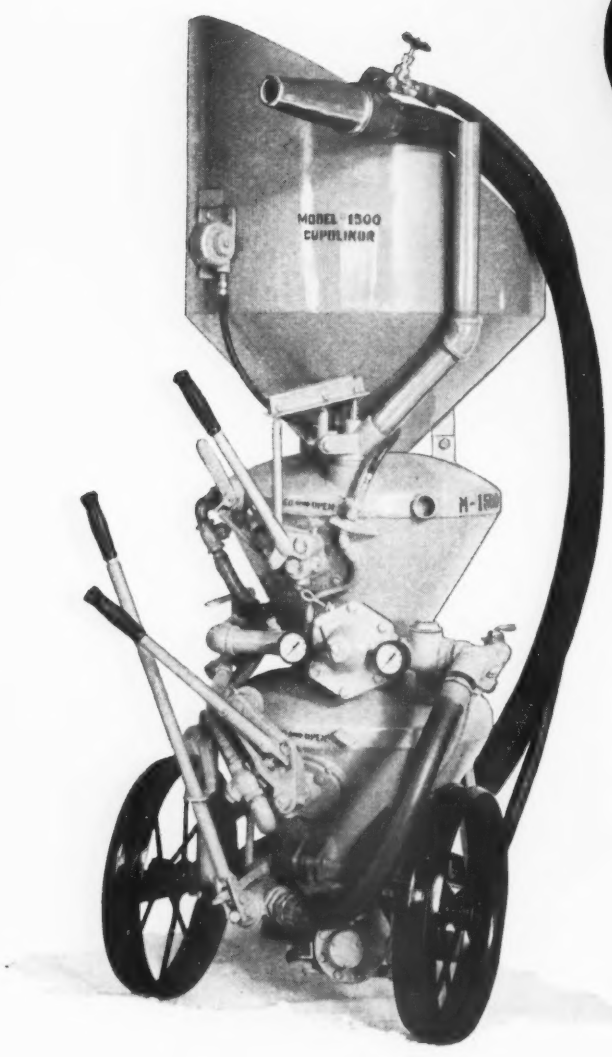

NEW

CUPOLINOR
1500

HIT OF THE FOUNDRY SHOW

THE NEW GUN FOR REFRACTORIES – Eastern Clay proudly presents the finest refractory gun in history, created to give the foundryman the sweetest, smoothest, easiest operating gun he ever handled. The new *Cupolinor 1500,* built on the success of hundreds of installations of the original and widely popular *Bondactor,* is completely re-designed with many new features that will give you a new experience in automatic operation, simplified handling and control and high-speed, long-life, low-cost performance.

Write today for folder "Patching with Cupolinor"

EASTERN CLAY PRODUCTS DEPT.

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

General Offices: 20 North Wacker Drive, Chicago 6

FRONTIER 40-E Aluminum Alloy

Improves with Age

FRONTIER 40-E Aluminum Alloy			
TIME AGED	YIELD STRENGTH	TENSILE STRENGTH	ELONGATION
21 days	25,440	34,400	5.1
2 years	31,300	39,300	4.5
2½ years	30,650	39,050	4.5
3 years	29,400	37,900	4.0
4½ years	30,075	38,000	3.75
8 years	31,550	37,025	5.5

The above figures were derived from 12 sample casts made over a period of 8 years. Figures shown are the average of all the samples in each group.

As shown in the table at the right, castings made of Frontier 40-E Aluminum Alloy grow stronger as they age without brittleness or loss of elongation. Yes, parts made of Frontier 40-E actually grow stronger while in use! Frontier 40-E is the outstanding high-strength aluminum alloy, due to a unique metallurgical formula. Frontier 40-E is an aluminum alloy containing zinc with magnesium, titanium, and chromium as added ingredients that result in great strength and absence of brittleness without special and costly heat treatment. It has been proven by extensive tests that "40-E" reaches stability at room temperature. After this stabilization has taken place there is little further change either to increase or decrease physical values. Frontier 40-E Aluminum Alloy is also Shock Resistant; Corrosion Resistant, even under stress; has excellent machineability; is fine grained for Pressure Tightness.

Technical advice and service is available to designers and licensees.

Please send me a copy of the Alloy Data Book giving engineering and metallurgical facts on the physical properties of Frontier "40-E".

Name .....

Company .....

Address .....

City .....

State .....

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NEW AND REVOLUTIONARY SUPER TUMBLAST

provides:

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SUPER SAVINGS in cost of maintenance

SUPER TIGHT machine construction

SUPER BLASTING wheelabrator unit

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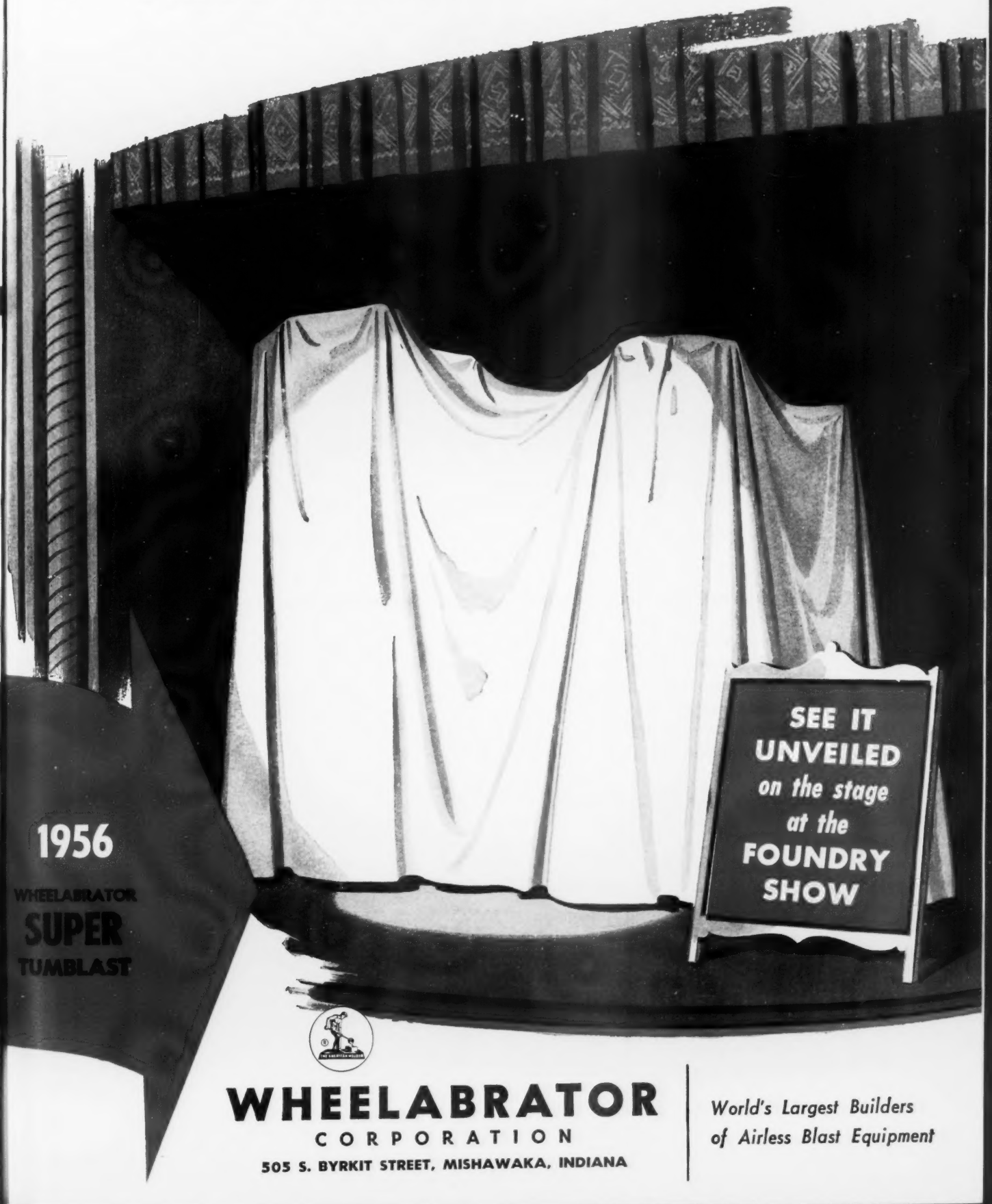
IN BLAST CLEANING DEVELOPMENTS



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CORPORATION
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World's Largest Builders of Airless Blast Equipment

JUNIOR'S SOLO WINS AT POLO

(control does the trick)

CHIEF KEOKUK:
"Where polo ball? How me hit ball when no see 'um?"
CHIEF KEOKUK JR.
"This Injun version of 'hidden ball trick.' Control of ball wins chukker!"
PRINCESS WENATCHEE:
"Junior's goal is control —and that always pays off!"

Control pays off . . . in polo or processing iron and steel! Many leading foundries and steel plants control costs and quality with Keokuk Silvery Pig Iron . . . the superior form of silicon introduction. Pig for pig, car for car, its uniformity never varies. Handle it by magnet . . . charge it by weight (or count the piglets for equal accuracy). Leading aluminum producers specify Keokuk Silicon Metal for uniform high purity.

When you think of SILICON think of KEOKUK!

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3504 Carew Tower, Cincinnati 2, Ohio
8230 Forsyth Blvd., St. Louis 24, Missouri

Keokuk Silvery Pig Iron is available in 60 and 30 pound pigs and 12½ pound piglets . . . in regular analysis or alloyed with other elements to match your requirements.

Move them while they're hot! Moving ingots is just one of the many jobs handled by Clark trucks at American Alloy Co., Kansas City, Mo.

Move them while they're hot . . . cooling can cost you production!

In a fast operating foundry the time to move ingots is while they're hot. Minutes after drawing off the mold, a versatile Clark fork truck can pick up hot ingots . . . move them to storage for cooling. Floor space is kept clear for further production.

American Alloy's versatile Clark truck handles scrap with a Bottom Dump Hopper attachment. When straight forks are needed, the Hopper attachment is easily and quickly removed.

Or if the job calls for handling scrap, a Clark fork truck with a Bottom Dump Hopper is used. Or maybe the Clark truck will have Rotating Forks for dumping castings, or, maybe it will drive into annealing ovens to stack pots. The point is—whether using straight forks or special attachments—your Clark truck will keep busy on a multitude of jobs.

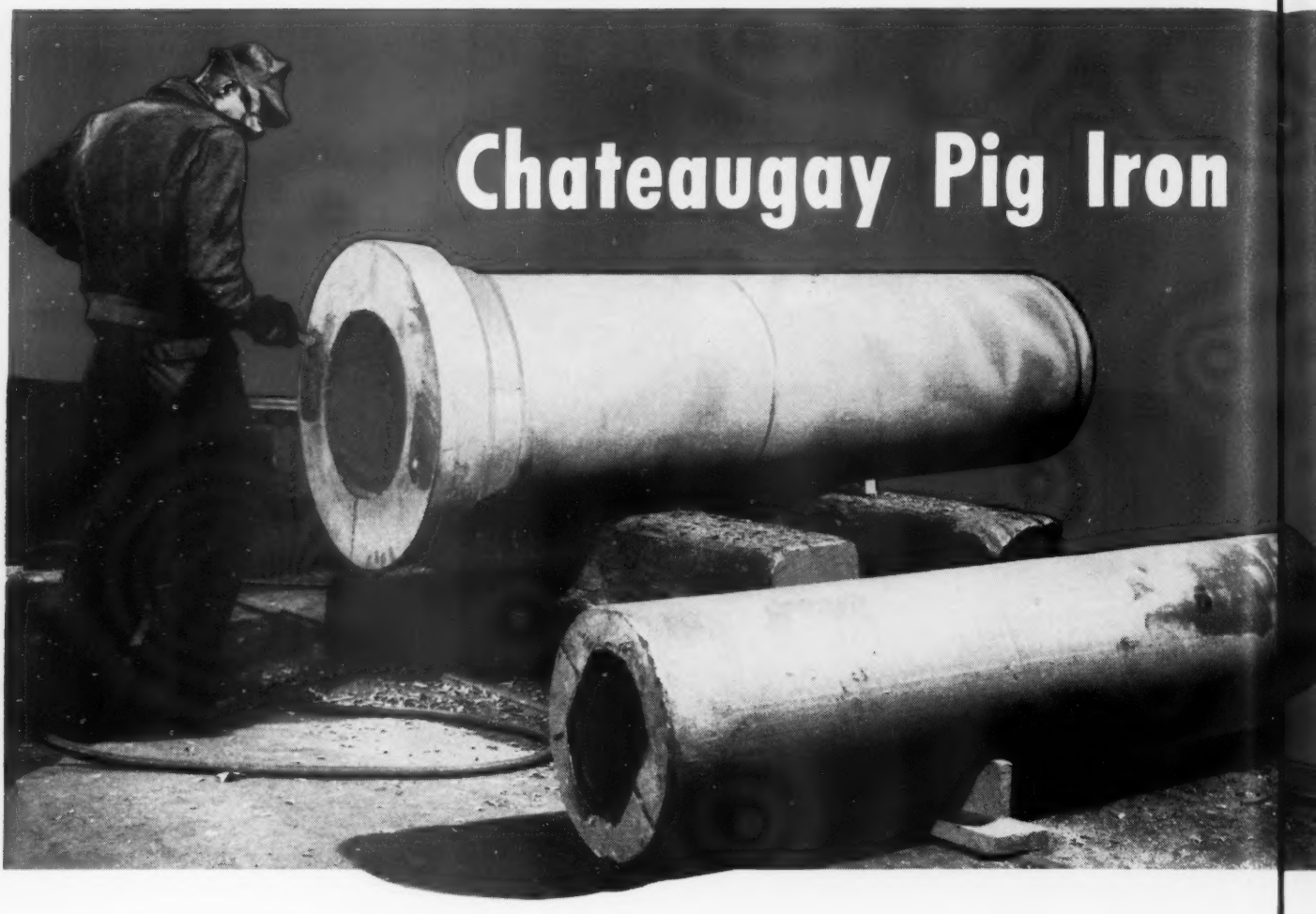
Gas, LP gas, diesel or electric—from ½ ton to 12 tons capacity—no matter what power type or size, your Clark truck is *full time* equipment. Take a look in the Yellow Pages under "Trucks, Industrial" for your local Clark Dealer. He's the man who can show you the dozens of uses a Clark truck has in *any* foundry . . . namely yours.

A BETTER BUY WITH LOCAL SUPPLY—*Genuine Clark Parts*

CLARK® EQUIPMENT

Industrial Truck Division
CLARK EQUIPMENT COMPANY
Battle Creek 16, Michigan

For more information, use Reader Service Card, page 187



The Atlantic Foundry Co., of Akron, Ohio, is thoroughly sold on Chateaugay, Republic's Premium Pig Iron. Here is how Mr. Marcel Reymann, Vice President of Iron Foundry Operations, puts it:

"We have a job in our shop right now that I don't think could be done economically without Chateaugay. It's a ram and cylinder casting for a hydraulic press used in making plywood. Up until a few months ago, we made these parts of cast steel to withstand the tremendous pressures required by the completed press. Now we're making them out of "GRA-STEEL", using Chateaugay, and passing on a 21% saving to our customer."

Mr. Reymann continues: "We've tried other types of iron over the years and have settled on Chateaugay as a good solid, dependable iron. Much of our success in producing consistent quality castings can be attributed to the year-in, year-out uniform chemistry of Chateaugay, with each carload being as good as the last."

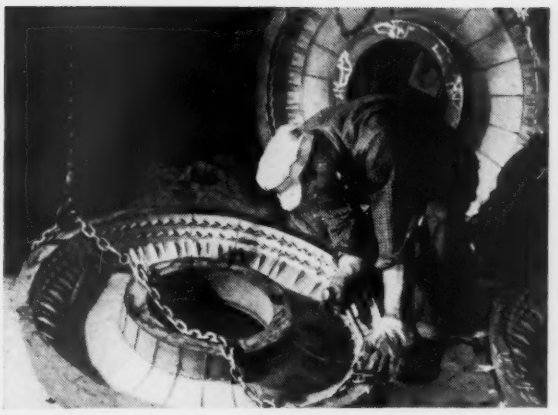
Why not check your own production in the light of these advantages? Or better yet, mail the coupon to secure the services of a Republic Pig Iron Metallurgist. He will be glad to demonstrate how you can benefit by using Chateaugay, the low-phosphorous, copper-free pig iron.

REPUBLIC

REPUBLIC STEEL

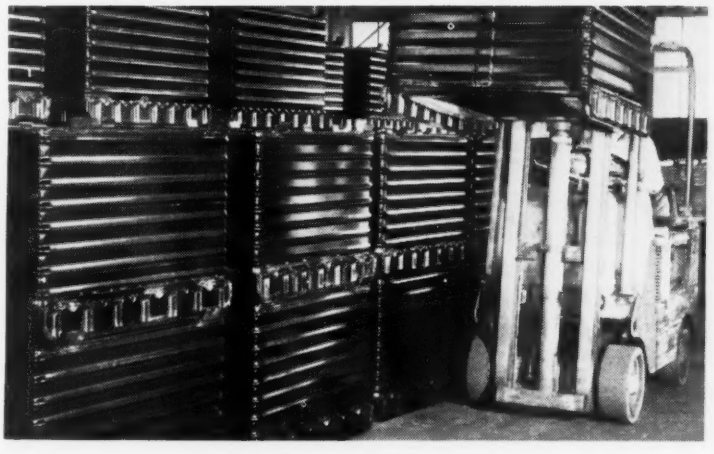
World's Widest Range of Standard Steels

permits foundry to pass on 21% savings to customer



LONG-TERM SAVINGS are yours when you use Republic Chain Products for your heavy-duty handling operations. Not subject to kinking or fraying, chain delivers long service with complete safety. Republic can furnish the proper type and accessories for all applications in alloy, high carbon or low carbon steel, and wrought iron. Send coupon for data.

TIME SAVINGS in your store room can be realized by using Republic Wedge-Lock Steel Shelving, especially designed for high stacking of great weights. Joints actually grow tighter and stronger as stored weight increases. Result is orderly stocking of products or supplies. Location of needed items is easy; time spent taking inventory is minimized.



GAIN SAVINGS IN SPACE for increased production or improved materials movement by using Republic Materials Handling Equipment. Complete line includes all types of steel boxes, skids, pallets and stacking racks. All units are ruggedly constructed to assure long, efficient service at lowest per-year cost. For illustrated literature, clip and mail coupon, today.

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☐ Please have a Pig Iron Metallurgist call.
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Improve the Structure of Cast Iron

with

CHROMIUM!

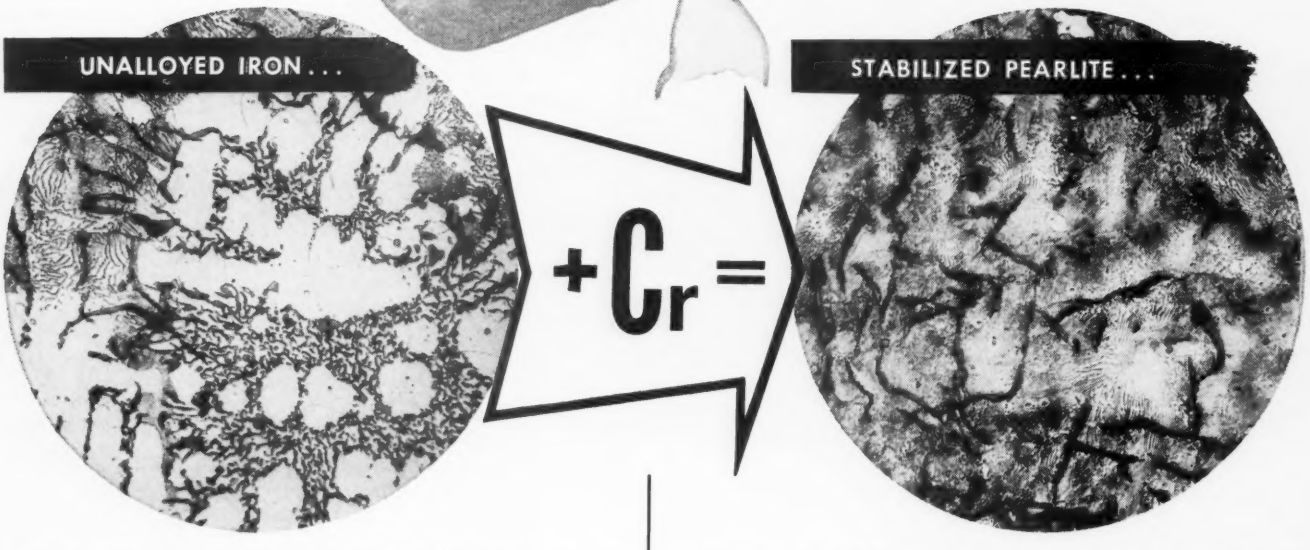

Figure 1. This micrograph (nital etch x 250) shows a critical section in the bore of an automotive cylinder. The section is made of unalloyed iron containing 3.24 per cent carbon and 2.12 per cent silicon. Note the large white areas of ferrite which make the cylinder soft and subject to failure by wear and scuffing.

Figure 2. Here is the same location in a similar cylinder made of chromium iron. The iron contained 3.24 per cent carbon, 2.45 per cent silicon, and 0.51 per cent chromium. You can see that the addition of chromium has produced a fine-grained pearlitic structure which is resistant to wear and heat.

Today, high-quality iron castings must meet specifications calling for specific microstructures, especially in critical sections where failure is most likely to occur. For the foundryman who must guarantee a pearlitic structure in castings subject to wear, heat, and abrasion, chromium is an indispensable alloying element.

Unalloyed iron may show wide variations in microstructure in the same casting, especially in sections subject to rapid cooling. These sections will usually contain large quantities of ferrite, as shown in Fig. 1. Addition of as little as 0.25 to 0.50 per cent chromium, however, will prevent the formation of ferrite, giving a stable pearlitic structure, as shown in Fig. 2. These stabilized chromium irons are widely-used in castings for heavy-duty automotive engines.

ELECTROMET produces a complete line of chromium alloys for use in structure control of cast iron. For ladle additions, ELECTROMET makes several grades of ferrochrome and ferrosilicon-chrome. When chromium is added to the cupola, foundrymen may use "EM" chromium briquets. For complete information about these chromium alloys, as well as technical assistance in their use, contact your nearest ELECTROMET office.

HALF A CENTURY OF DEVELOPMENT IN FERRO-ALLOYS AND METALS
50th Anniversary
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1906 ... 1956

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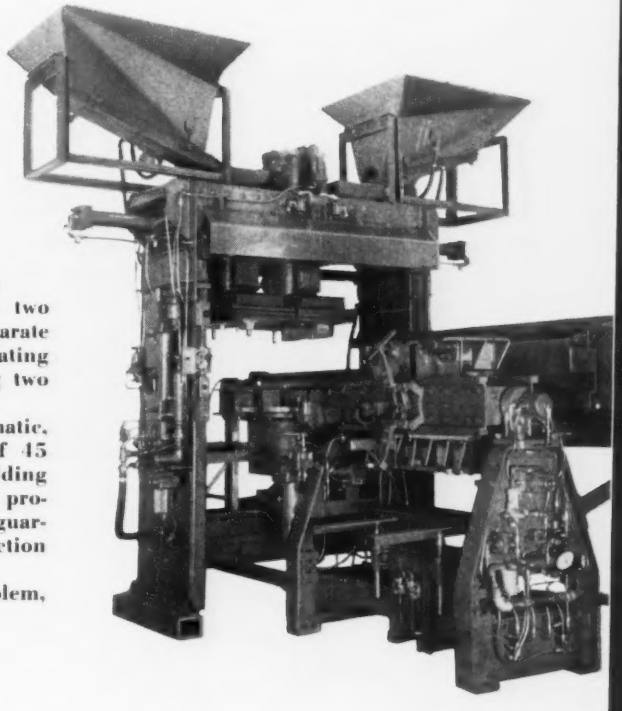
DEMMLER

The Oldest Name in Core Blowers



the DEMMLER 3T . . .

Owning a DEMMLER 3T is like owning *two* core blowers at the same time. 3T is fast and efficient —*has actually increased production over 100% in some foundries* —and it plays a specialized role in the giant farm machinery industry.

This versatile machine blows its two core boxes separately. It has two separate magazines and two automatic vibrating sand feeders, which permit running two different sand mixtures at one time.

The DEMMLER 3T—a fully automatic, one-man operation—is the result of 45 years engineering experience in building core blowers which today lead in high production. Low maintenance cost is a guaranteed product of Demmler construction and design.

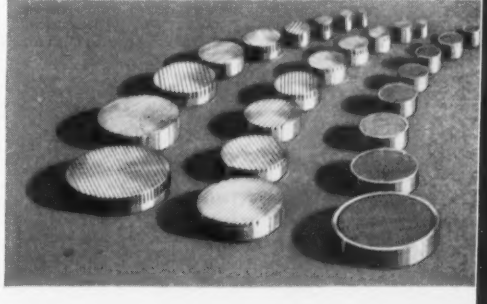
When yours is a core blowing problem, call in a Demmler engineer.

PRECISION CORE BOX VENTS

Demmler is by-far your best source for precision core box vents, manufactured by specialists who pioneered in the core blower industry. Many sizes, slot widths and screen meshes are available in brass and steel core box vents.

NEW *HL* ***150 Mesh Vents***

A new general purpose vent which practically eliminates the cleaning courser screens demand. Write for literature on Demmler vents.



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C FURNACES

melt metal for almost everything!

The list on the opposite page testifies to the versatility of these great furnaces. Hundreds of high quality products, in bronze, brass, iron and ductile iron, are cast from the efficient flow of metal produced by Detroit furnaces.

The indirect arc, free of the molten metal at all times, produces alloys of precise analysis in melt after melt. Rocking action results in maximum heat transfer, optimum utilization of power.

Detroit Rocking Electric Furnaces are capable of doing many jobs well. One furnace, equipped with extra shells, can melt a variety of metals and alloys. Interchange of shells is quick and easy, and the savings in installation work, transformers, wiring and floor space is large and important.

Capacities of Detroit Electric Furnaces range from 10 to 10,000 pounds.

Send us your operating data. Let our engineers show you how a Detroit Electric Furnace will meet your needs.

See Us At The Show!
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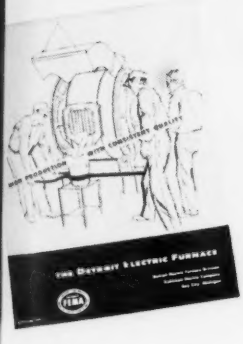

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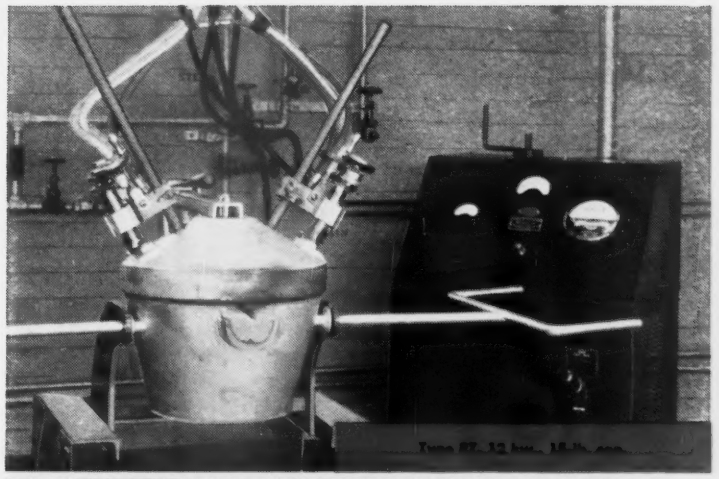
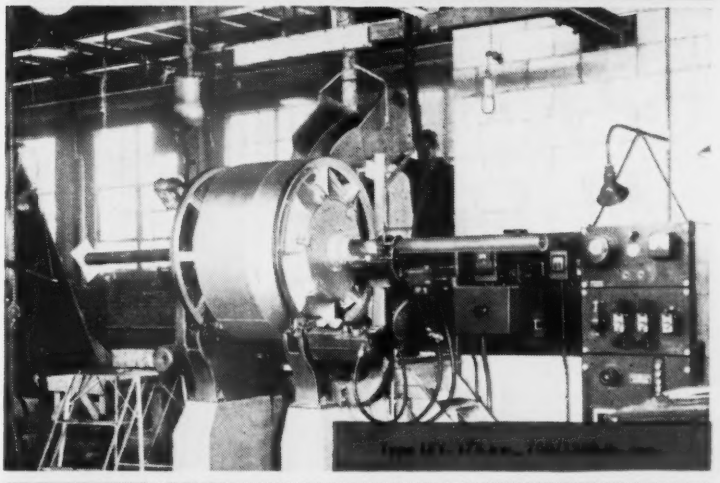
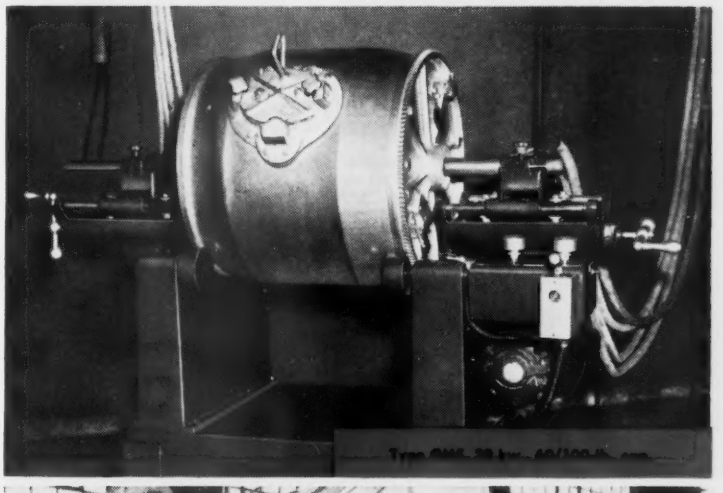
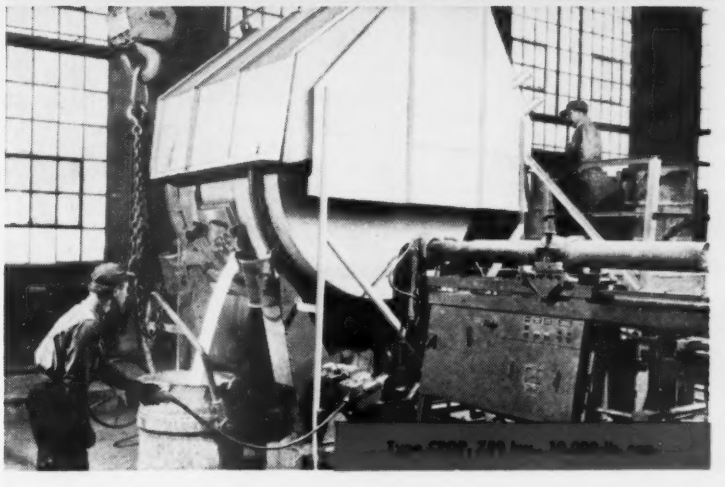
"High Production with Consistent Quality," shows and describes how you can get fast, modern, efficient melting. Includes ratings and operational data on all Detroit furnaces. Write today for Bulletin 559.





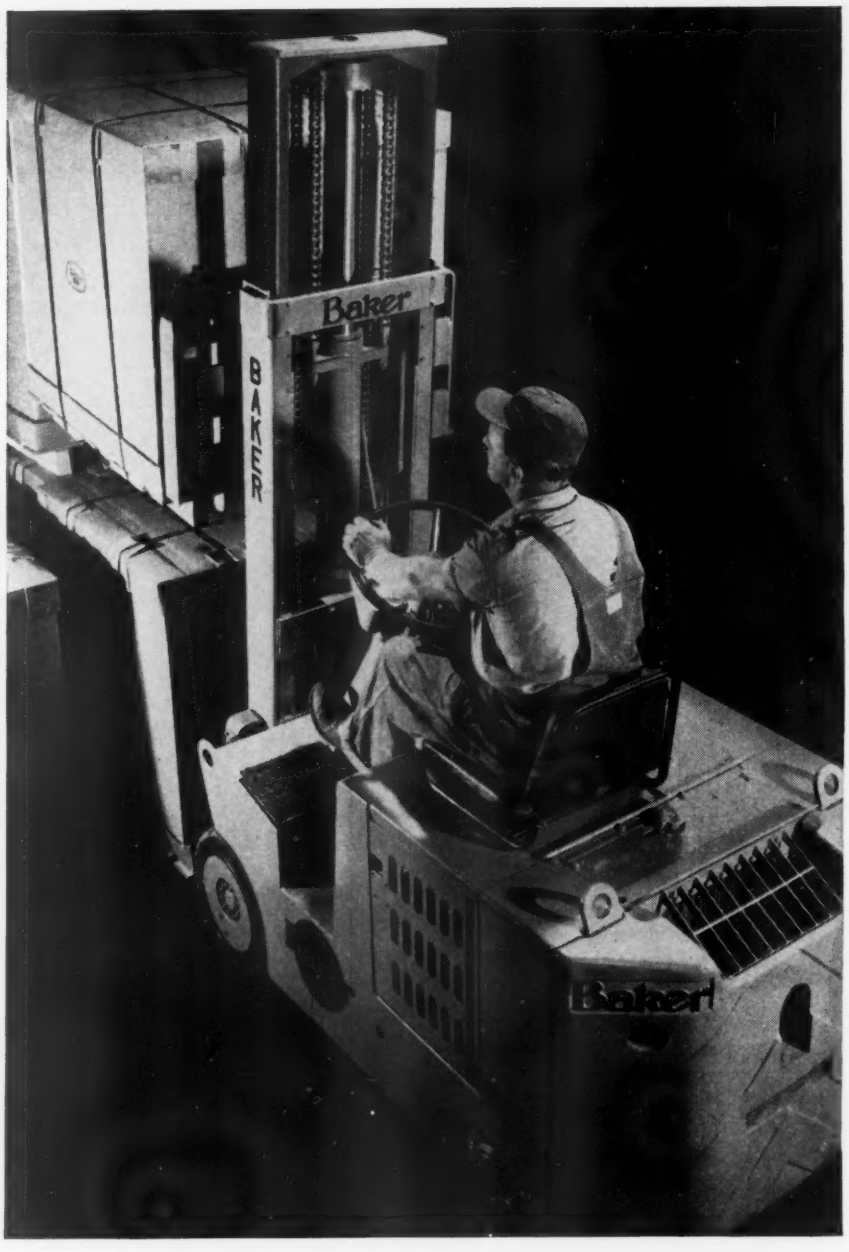




DIVISION
Bay City, Michigan

the gas fork truck that makes the fewest and shortest trips to the maintenance shop...

BAKER "FG"



Industrial trucks "out-of-service" mean dollars down the drain... not only repair dollars, but even more dollars for lost work. That's why we loaded the Baker "FG" gas trucks with features that mean substantially more time on the job. Here are a few:

Heavy-duty industrial truck engine operates at optimum RPM for least strain and abuse. Pistons are balanced to grams instead of ounces, crankshaft to 4 inch-ounces, connecting rods to 2 grams. Compact, rigid "power train" requires no troublesome universal joints. Clutch housing is split for better accessibility. Single oil supply lubricates entire assembly. Large full-floating, self-equalizing, self-energizing brakes have single-point adjustment.

Baker "FG" gas fork trucks, available in 3000, 4000, 5000 and 6000 pound capacities, are the only gas trucks with a full 6-months' warranty... an added assurance. Write for specific bulletins.

Baker®
handling equipment

THE BAKER-RAULANG COMPANY

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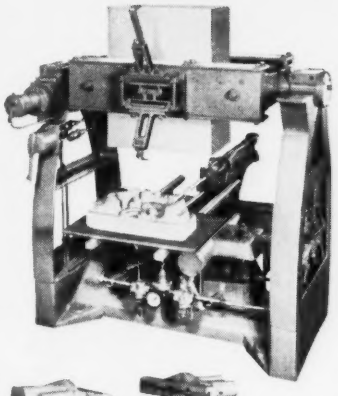
Subsidiary of Otis Elevator Company

6G2

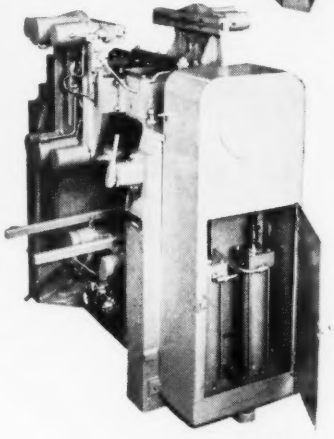
BOOST CORE OUTPUT UP TO 400%

...stabilize quality, too!

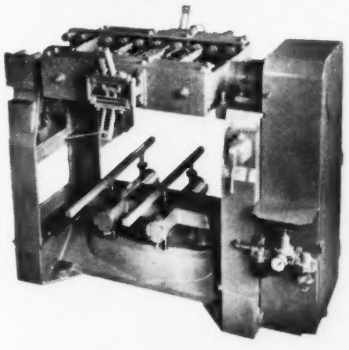
3 BASIC MODELS



Automatic Double Rollover Core Draw Machine. Shown with automatic pushout device (optional equipment), (Model No. SP-2020), which positions the drawn cores for easier removal. Pushout device and elevator mechanism available for all Sutter Core Draw Machines.



Automatic Double Rollover Core Draw Machine with side draw backs. Model SP-541. Cycle—approximately 20 seconds. Maximum Core box size 26" long x 13" wide x 10" deep.



Automatic Double Rollover Machine for heavy duty operation. Operating cycle is 6 seconds minimum. Available in three standard sizes.

SUTTER

CORE DRAW MACHINES

Because they provide completely automatic cycle, Sutter Core Draw Machines boost production from 300% to 400% and provide absolutely uniform high quality since the human element is entirely removed from the draw operation.

All the operator need do is to place the core dryer and, while the cycle continues automatically, remove the core drawn from the previous cycle. The dryer is clamped, the box rolled over and the core is drawn without any attention from the operator.

Because of the simplicity of operation, peak production can be maintained easily by unskilled operators. When used in conjunction with a blower, the operator can perform both the blow and draw operations with ease.

In addition to three standard models, each in a variety of sizes, Sutter also designs and builds special units to suit unusual needs. Our engineers will be delighted to discuss your operations and point up the savings these versatile machines will provide to you. Just write or wire today for technical bulletins.

SUTTER

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to a . . . FOUNDRYMAN

wheel life and PERFORMANCE count!

Ever ask the foreman of your cleaning room about the *actual* cost of a grinding wheel? He'll tell you a wheel's *actual* cost is determined by the number of castings ground over the wheel... the accuracy and finish left on the work . . . and the dressing time needed to keep the wheel operating at its best.

Judged on this basis, Macklin wheels cost less in the long run. Less because they give longer wheel life, remove more metal, provide consistent wheel performance, and require less dressing.

Call your nearest Macklin distributor or sales office. A trial will convince you.

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manufacturers of: GRINDING WHEELS AND OTHER ABRASIVE PRODUCTS

Coming in May

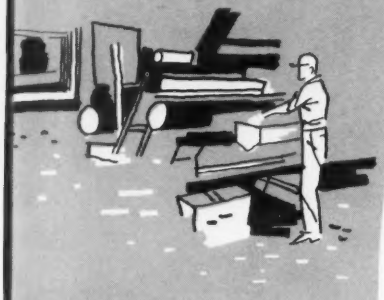
FOUNDRY

60th

Pre-Convention Issue

A SPECIAL EDITORIAL REPORT

The Tools for Tomorrow's Foundry Progress



The editors of FOUNDRY announce presentation of a special discussion of this important subject—viewed from five "key angles." This year's report will discuss developments and trends in these particular areas:

1. **FOUNDRY TECHNOLOGY**— significant foundry developments of the past two years and an estimate of those which appear destined to have the most pronounced effect on future foundry progress.
2. **FOUNDRY PRACTICE**— what have been the trends in foundry mechanization, modernization, automation?
3. **MANAGEMENT LEADERSHIP**— a report and discussion of how foundry management is preparing to meet the competitive demands of tomorrow.
4. **EQUIPMENT and SUPPLIES** — foundry suppliers will state the direction of trends in machines and materials in the next ten years as they see them.
5. **FOUNDRYMEN TELL WHAT THEY WANT**— what types of machines, supplies and services do foundrymen want from the equipment manufacturers?

Watch for this SPECIAL REPORT in the May issue . . . . . .

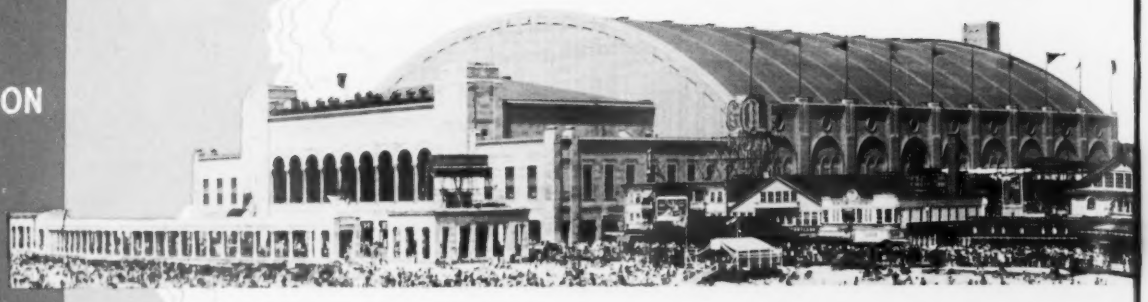
FOUNDRY

A Penton Publication

60th
ANNUAL CONVENTION AND SHOW

AMERICAN FOUNDRYMEN'S SOCIETY

ATLANTIC CITY
May 3 to 9, 1956



FOUNDRY
PRE-CONVENTION ISSUE
MAY, 1956

The May Pre-Convention issue of FOUNDRY will be mailed one week earlier than usual to reach foundrymen well in advance of the opening of the Atlantic City convention.

FEATURING:

✔ **Tools for Tomorrow's Foundry Progress:**

A 5-part special editorial report.

✔ **AFS Congress and Exhibit:**

Outline of Technical Program and other Congress Features, Awards Winners, Equipment and Supplies Exhibitors and their New Products.

✔ **Feature Stories:**

The regularly scheduled feature stories characteristic of each issue of FOUNDRY will appear as usual in this issue.

✔ **Departments and other features:**

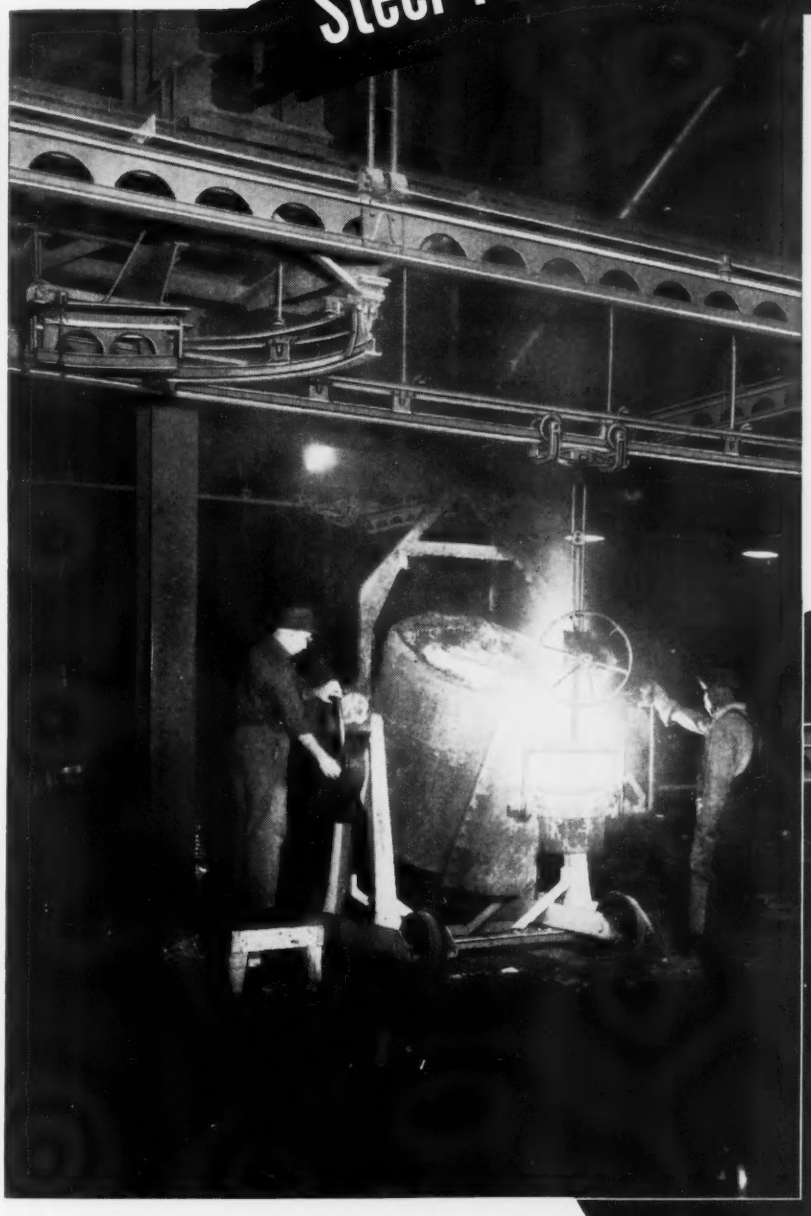
Questions and Answers, Late News, Foundry Developments, and all other regular departments will appear as usual.

And in June... **POST-CONVENTION ISSUE**

The news and picture report of the Atlantic City convention and technical sessions will be a special feature of the June Post-Convention issue of FOUNDRY.

FOUNDRY—A Penton Publication · Penton Building · Cleveland 13, Ohio

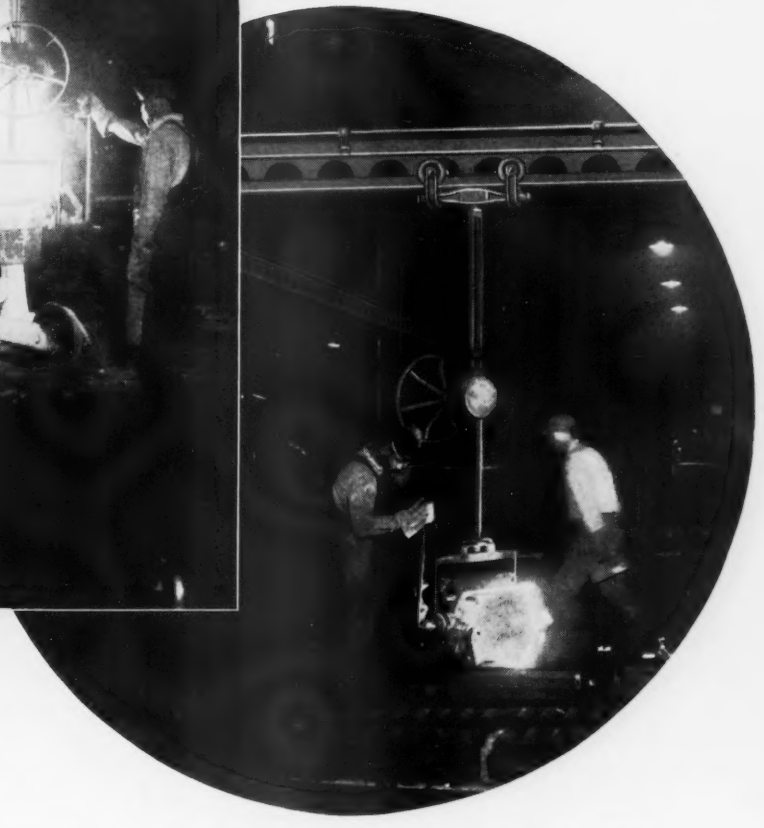
Steel Foundry *Cuts Production Costs*



Not only has Cleveland Tramrail been an important factor in speeding production and lowering costs in a large Michigan steel foundry, but it has eased the work for the employees and aided their safety.

Because of the gratifying experience with the original equipment installed in 1936, more has been purchased every ensuing year. Today Cleveland Tramrail equipment provides handling coverage for the entire pouring floor, the large cleaning department, and will be found in every section of the plant.

This progressive foundry (name on request) is fully convinced of the many advantages that can be secured with Cleveland Tramrail equipment.



In nearly every instance, each of the many installations of Cleveland Tramrail at this foundry, paid for itself within the first six months of operation.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

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THE CLEVELAND CRANE & ENGINEERING CO.
3805 EAST 286th STREET *WICKLIFFE, OHIO*

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OVERHEAD MATERIALS HANDLING EQUIPMENT

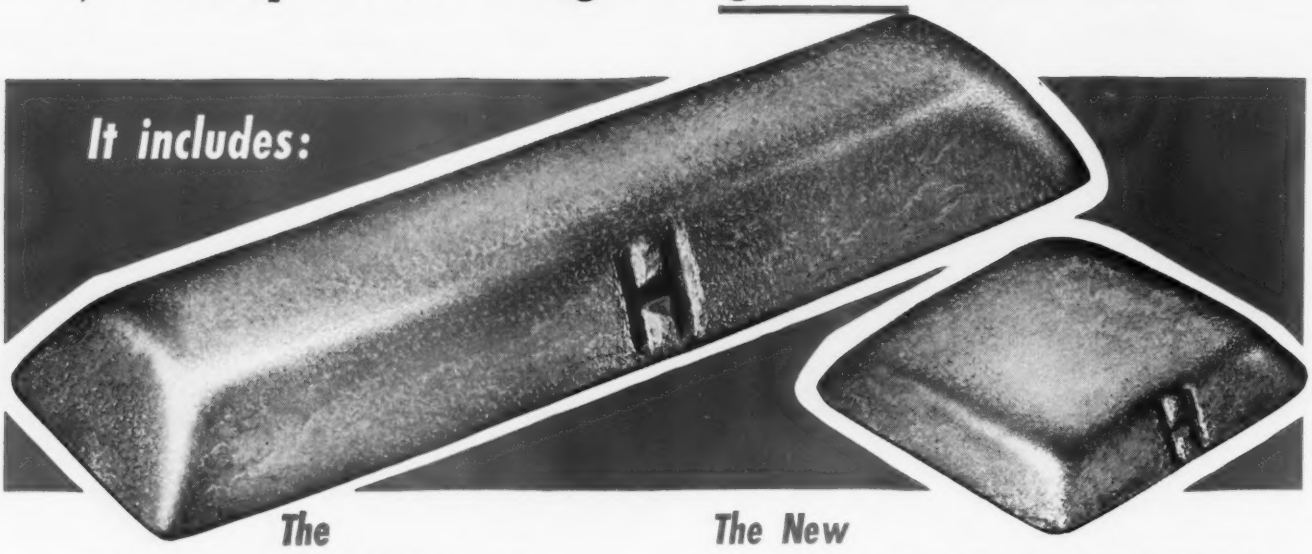
Now, more than ever, you can depend on

HANNA

as your best source for

PIG IRON

- *Our merchant capacity is bigger than ever*
- *Our plant is better than ever*
- *Our product range is greater than ever*



The

HANNA 38-POUND PIG

The foundryman's favorite standard pig. Available in all grades, silvery and HannaTite. A good example of the quality that has made Hanna "the best known name in iron."

The New

EXCLUSIVE HANNATEN INGOT

For 10-lb.-pig users, this new ingot means no free-carbon pockets, finer grain structure, more even melting. Available in all grades, silvery and HannaTite—an extra-close-grain iron.

THE HANNA FURNACE CORPORATION

Buffalo • Detroit • New York • Philadelphia

Merchant Pig Iron Division of

NATIONAL STEEL CORPORATION

MANHATTAN PORTABLE WHEELS
Lowest Cost for Metal Removed!

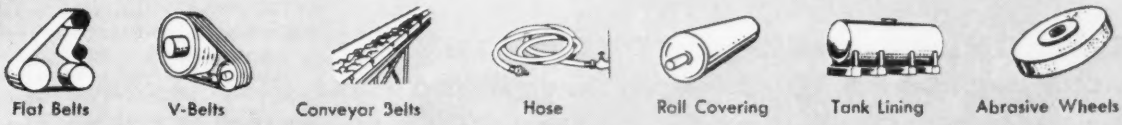
Fast cutting action *plus* long wheel life account for more output per man hour and lower production costs with Manhattan Portable Wheels. Individual engineering for each customer's job requirements is the secret of their success. Every phase of the wheel you use—type of abrasive, grain size, hardness, structure and bond—is determined only after a careful analysis of your grinding problems . . . the amount of metal you want to remove, the finish you require.

The result is that workers prefer Manhattan Portable Wheels because they get more pieces done. Management prefers them because they assure faster, more uniform quality production . . . and they last longer. Flared cup, raised hub, cone, plug and mounted point, or straight—there's a Manhattan Portable Wheel that can remove *more* metal, *faster*, at *lower* cost on your job.

Let a Manhattan sales engineer show you how you can boost production and reduce costs . . . get "More Use per Dollar" . . . with Manhattan Portable Wheels and other types of high speed, heavy duty abrasive wheels. RM 631

WRITE TO ABRASIVE WHEEL DEPARTMENT
MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



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COLEMAN OVENS

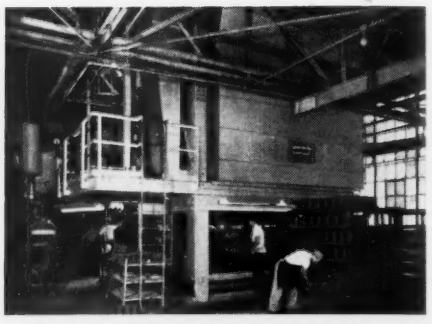
turn minutes into money...

Fast, efficient production of uniformly good cores and molds is vitally important to foundry profits.

When you use old, out-dated core and mold ovens the minutes and hours lost in costly rejects and make-overs . . . the time and effort lost in wasted man power, the production lost in casting scrap eat your profits away. Modern design and exclusive advantages of Coleman Ovens result in immediate production economies, reducing overall core department costs by as much as 50% ! Such savings mean increased profits and rapid investment amortization.

More than half a century of specialized foundry oven experience is your assurance that the Coleman Oven recommended to you will do your work to your complete satisfaction. ***As builders of the world's only complete line of foundry ovens we have no reason to recommend any but the best for your purpose.*** Let our experienced engineers give you practical suggestions for your particular requirements.

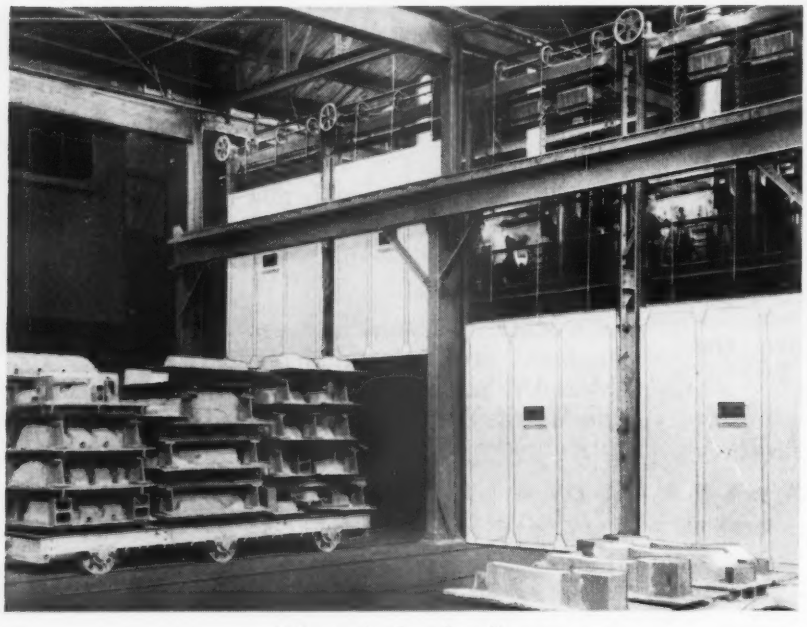
WRITE FOR BULLETIN 54



Coleman Tower® Oven

Coleman Transrack Ovens

Coleman Dielectric Oven



Coleman Car-Type Core Ovens

A COMPLETE RANGE OF TYPES AND SIZES . . .
for every core baking and mold drying requirement:

Tower Ovens • Horizontal Conveyor Ovens
Car-Type Core Ovens • Car-Type Mold Ovens
Transrack Ovens • Rolling Drawer Ovens
Portable Core Ovens • Portable Mold Dryers
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THE FOUNDRY EQUIPMENT COMPANY

1821 COLUMBUS ROAD **CLEVELAND 13, OHIO**

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STANDARD QUALITY

means sand the same every time

Blackhawk silica has the same purity, uniformity, and dependability with every order and in any quantity. That's what Standard specification means to you, Mr. Foundryman, whose product quality depends on the ingredients you use.

Standard's silica is mined from an area wonderfully rich in tremendous deposits of St. Peter's sandstone. Painstaking washing and grading processes produce foundry sands second to none in the world.

The Blackhawk brand possesses an unusually high sintering and fusion temperature point plus marked permeability which allows free passage of gases.

Standard's accessibility to both excellent rail and water transport facilities affords swift delivery anywhere in the nation. For your next order of silica sand, phone the Standard distributor in your area.

BLACKHAWK SILICA SAND

The Blackhawk brand—used throughout the foundry industry as steel molding sands, special core sands, opening and parting sands, and facing sands.

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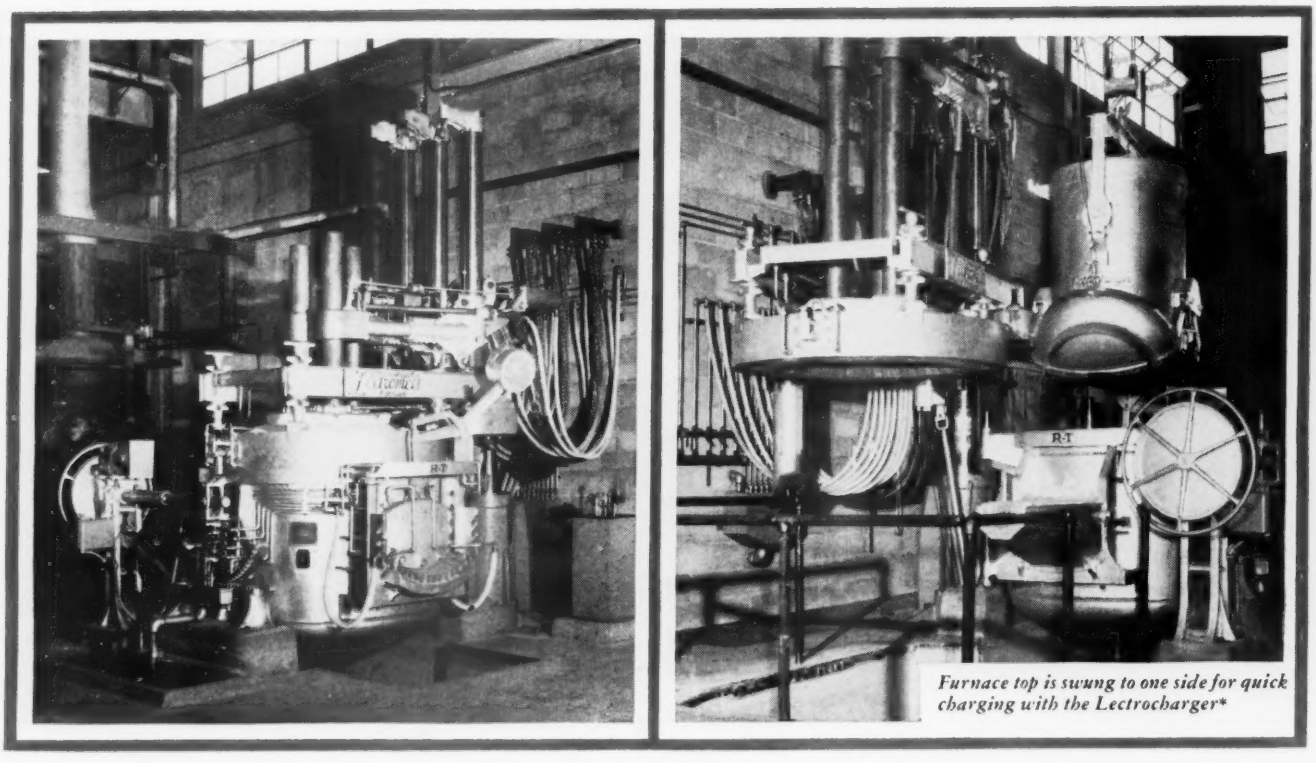
For more information, use Reader Service Card, page 187

"We needed to speed our production, so we added this Lectromelt* furnace

Now we melt 2200 pounds in approximately 45 minutes against a former one hour and 20 minutes for 1000 pounds," reports **Mr. Paul Moss,** *Metallurgist.*



*Furnace top is swung to one side for quick charging with the Lectrocharger**

METAL costs less per ton, now that this Type RT Lectromelt Furnace is on the job here at Eaton Manufacturing Company's Saginaw, Michigan plant. Very close control, too, is obtained in their production of chilled iron and hardenable alloy iron.

Whether you're working with irons or steels, a Lectromelt Furnace will give you precise control of temperatures and analyses at costs often comparable to cupola melting. Unmatched in flexibility, this furnace lets you make frequent and quick shifts in metal specifications, so necessary in a jobbing foundry.

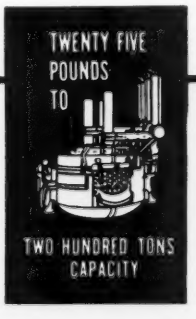
Lectromelt engineers will answer your questions and supply you with data on furnaces to meet your needs —25 pounds to 200 tons. For Catalog 9-A, write Pittsburgh Lectromelt Furnace Corporation, 314 32nd Street, Pittsburgh 30, Pennsylvania.

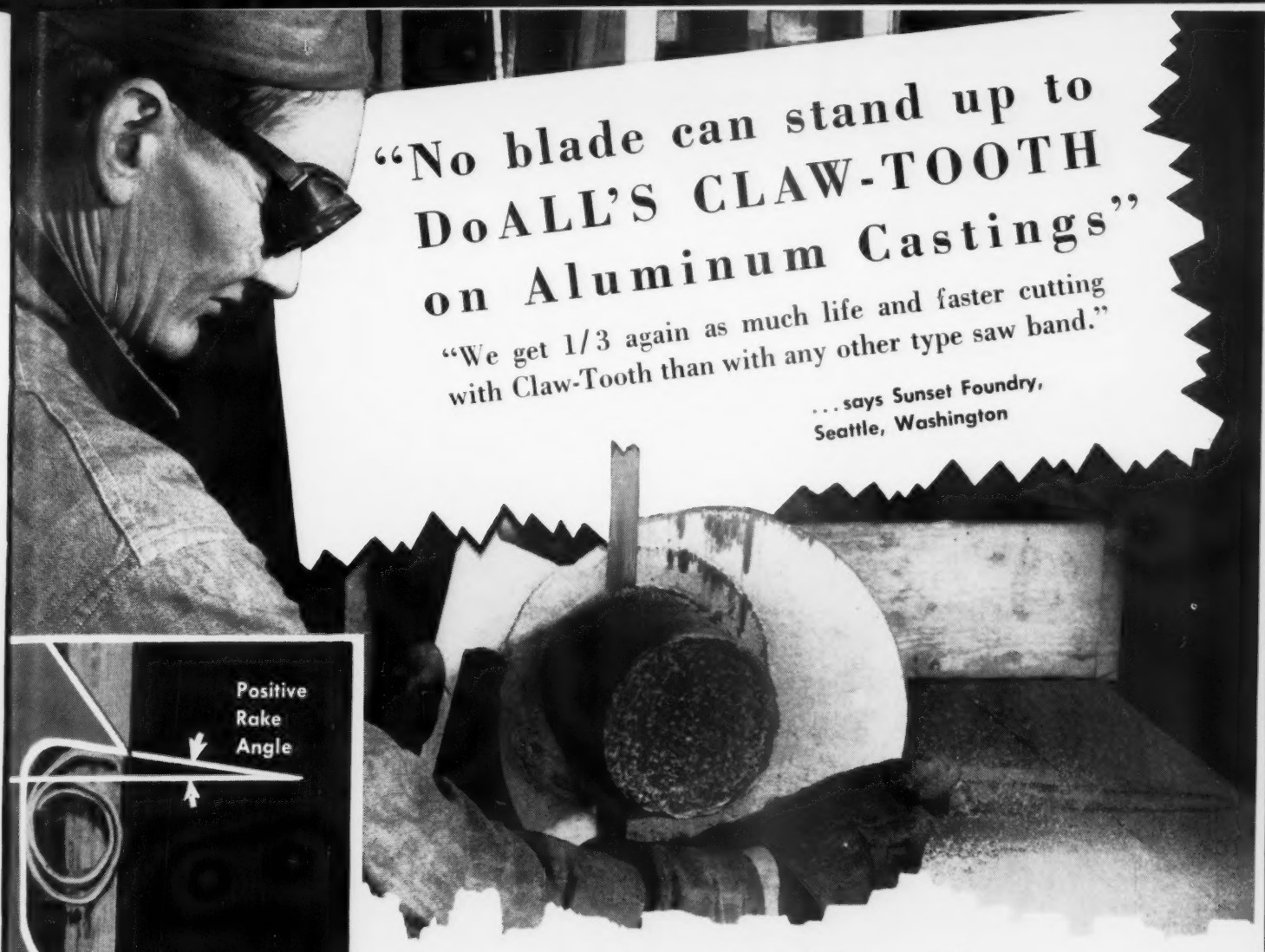
Manufactured in... GERMANY: Friedrich Kocks GMBH, Dusseldorf... ENGLAND: Birlec, Ltd., Birmingham ... FRANCE: Stein et Roubaix, Paris ... BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege ... SPAIN: General Electrica Espanola, Bilbao ... ITALY: Forni Stein, Genoa ... JAPAN: Daido Steel Co., Ltd., Nagoya

*REG. T. M. U. S. PAT. OFF

MOORE RAPID

WHEN YOU MELT... *Lectromelt*

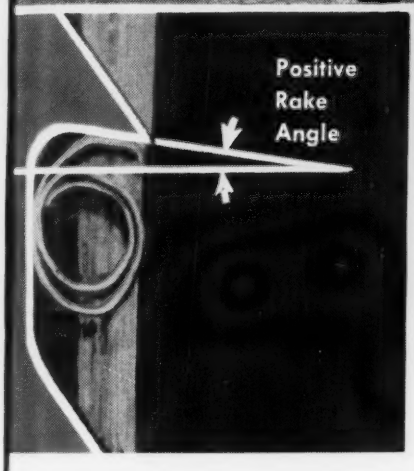




"No blade can stand up to DoALL'S CLAW-TOOTH on Aluminum Castings"

"We get 1/3 again as much life and faster cutting with Claw-Tooth than with any other type saw band."

...says Sunset Foundry, Seattle, Washington



User Tried Them All, Then Settled On Claw-Tooth Saw Bands

Sunset Foundry ran comparison tests of all types of saw bands cutting gates, risers and flash from castings. DoALL Claw-Tooth won by providing 1/3 longer life and faster cutting. A 5" dia. aluminum alloy #122 riser, above, is removed in 45 seconds with Claw-Tooth . . . other blades took minutes.

For foundry sawing Claw-Tooth can't be beat. Hardened positive rake angle teeth pull themselves into the work. The saw band cuts faster with less feed pressure resulting in more output per operator with less fatigue.

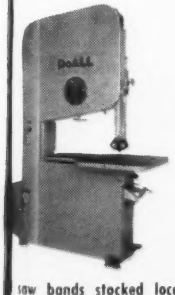
See this amazing saw band in action, in your plant, at DoALL's expense. Call your local DoALL Sales-Service Store or write:

THE DoALL COMPANY, Des Plaines, Illinois

Why Claw-Tooth Cuts Faster...

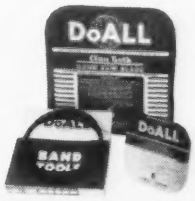
Claw-like Teeth, having a positive penetrating angle are designed to pull themselves into the work. As a result, Claw-Tooth cuts faster than other blades, with less feed pressure and less operator fatigue.

DoALL



The Zephyr Band Machine ... to secure the utmost in foundry sawing. Variable speed ranges up to 15,000 fpm. for standard or friction sawing. 36" throat depth, 20" work height. Write for free bulletin.

saw bands stocked locally in 38 friendly LL Sales-Service Stores. Call yours today.

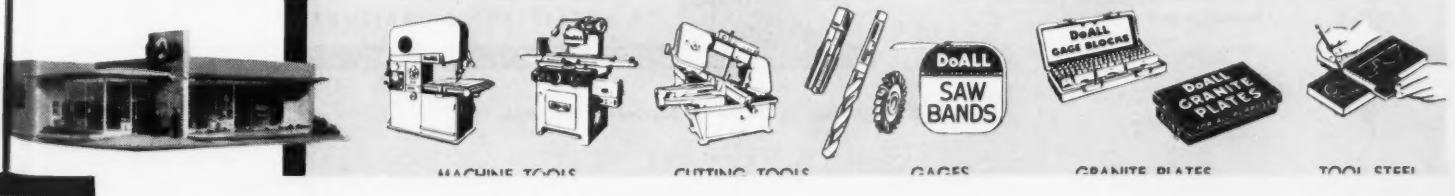


Seven standard widths, ¼" to 1½", and four pitches, 2 to 6, available in: Welded lengths to fit any band machine and 100' and 500' coils in exclusive "strip-out" boxes.

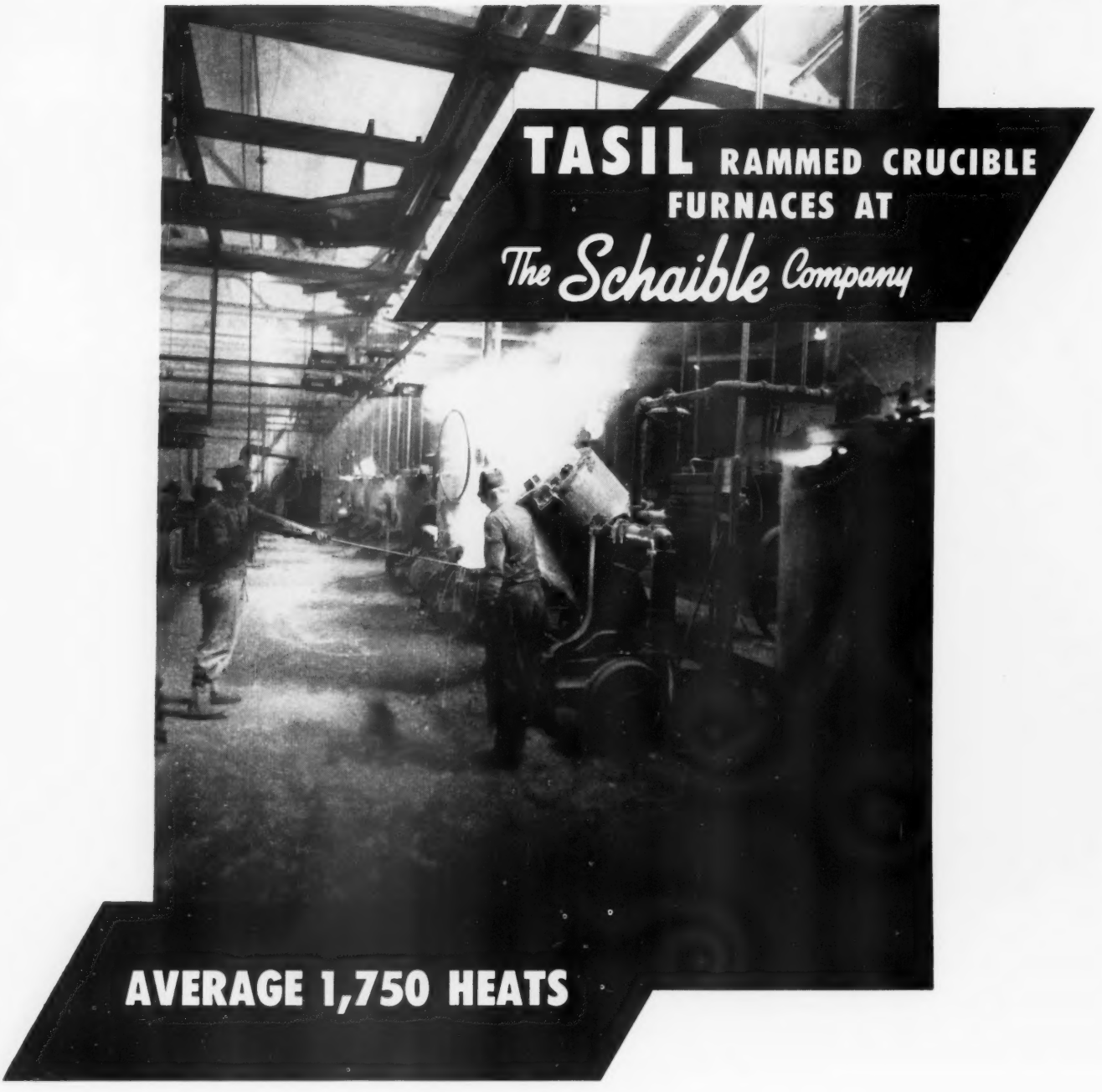
Ask for new 16 page free saw band selection catalog—details best type of saw band for type of work and available sizes, pitches, and widths. Write today!

DoALL, Claw-Tooth, and Zephyr are registered trademarks of The DoALL Company, Des Plaines, Ill.

SB-45



MACHINE TOOLS CUTTING TOOLS GAGES GRANITE PLATES TOOL STEEL



The Schaible Company, Cincinnati, Ohio, leading producer of plumbing and heating equipment, has standardized on Taylor Sillimanite #213 Ramming Mix for lining this battery of 17 #600-M Campbell-Hausfeld gas-fired crucible furnaces melting 700-pound heats—#275 crucibles. Tests have proved to Schaible that Taylor Sillimanite (TASIL) linings last longer, require less patching.

One TASIL rammed lining ran 2,051 heats of plumbing brass per lining. The average is approximately 1,750 heats. On a semi-continuous operation this means 1½ to 2½ years' service with a minimum of patching. This compares to 565 heats average for silicon carbide special shape linings with insulation backup. After considerable testing of other refractories, some cheaper, some more expensive, TASIL #213 Ramming Mix is the standard refractory lining.

TASIL works equally well in other types of crucible and barrel-type metal melting furnaces. Recommended for either gas or oil firing. Write for your free copy of Bulletin #315.

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A SUBSIDIARY OF NATIONAL LEAD COMPANY
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Says Hermann Good,
Foundry Manager
at Textile Machine Works

"We have used Tabor Cut-Offs nearly eight years and know they're the kind of cut-off we want at TMW—they're fast, precise and trouble-free."

15 hp Tabor-Brasive Cut-Off Machine in use at Textile Machine Works, Foundry Division, Reading, Pa. The Tabor machines greatly reduce snagging and finish-grinding costs.

Hermann P. Good has been Foundry Manager at Textile Machine Works for the past 15 years, and has been with the company for 23 years.

"TMW Foundry's mechanized facilities set a fast pace, but the Tabor Cut-Off machines never slow us down."

Tabor-Brasive Cut-Off Machines make fast, clean cuts, close to the casting. They cut through 2" dia. gates and risers of pure nickel in 12 seconds and can handle tough materials like nodular iron and titanium. They are easy and safe to work with — the operator gets a good view of work being cut. Because these Tabor machines have adjustable, precision bearings, the spindle can be kept free of end-play year after year. And because Tabor-Brasive Cut-Off Machines are exceptionally durable and trouble-free, they cut carloads of castings at pennies for maintenance.

Units range from 5 hp to 20 hp. On machines 7½ hp and larger, the cutting head can be swung to the side for handling large work. Write for Tabor literature today.

The TABOR Manufacturing Co. Division of
TURBO MACHINE COMPANY, LANSDALE, PA.

The Tabor Manufacturing Company
Div. of Turbo Machine Company, Lansdale, Pa.

☐ We'd like a copy of the Tabor-Brasive Cut-Off Machine Bulletin.

Also, we'd like a copy of the

☐ Bulletin on Flask Lift Machines
☐ Bulletin on Squeezers and Jar Squeezers
☐ Bulletin on Jarring Machines — Plain and Shockless
☐ Bulletin on Rollover Machines

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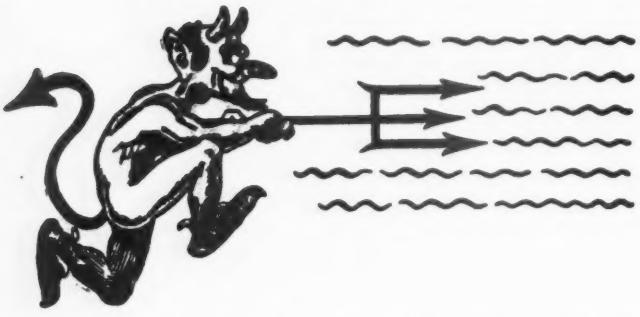
For more information, use Reader Service Card, page 187

Produce More Castings Per Heat with



Soffel's THERMOTOMIC® "HOTOP" LIQUIDIZER

Exothermic Carbon Free Liquidizer For Iron, Steel, Nodular Iron

This new head compound saves feeding metal in risers or feeding heads which can now be reduced in height 40 to 70%

SOFFEL'S THERMOTOMIC "HOTOP" CARBON FREE LIQUIDIZER is different from other head compounds in that "HOTOP" LIQUIDIZER does NOT contain powdered metal, is NOT a thermit compound. It is a patented exothermic compound entirely free of carbon, sulfur and phosphorus and can be used without danger of contamination on any ferrous metal or alloy.

"HOTOP" LIQUIDIZER also saves molding time as less sand is needed in the mold cope due to short height of risers. "HOTOP" LIQUIDIZER produces a liquid slag well over 4000° F. of heat and insulates the metal. The feeding metal will remain liquid at least 50% longer assuring adequate feeding while the casting cools and solidifies. Piping and shrink cavities caused by premature freezing of the feeding metal are eliminated.

THERMOTOMIC HOTOP LIQUIDIZER BRAND "B" SHOULD BE USED ON RISERS UNDER 4 INCHES IN DIAMETER GUARANTEED TO PRODUCE SOLID CLEAN CASTINGS

SOFFEL'S FAMOUS *Carbon Free* LIQUIDIZER FOR ALL METALS and ALLOYS

SOFFEL'S EXOTHERMIC CARBON FREE LIQUIDIZER is the leader in major foundries for use on both ferrous and non-ferrous metals and also in ingot production. It is the original scientific non-carbon, exothermic compound for feeding heads and risers.

When applied on the heads or risers, CARBON FREE LIQUIDIZER reacts within itself exothermically, producing a temperature above 3200° F. It actually increases the temperature of the feeding metal to a point well above that of the metal in the main body of the casting, thus ensuring that the feeding metal will be the last to freeze. In this manner, shrink cavities in the casting caused by premature freezing of the feeding heads will be eliminated. After the exothermic action has ceased, the LIQUIDIZER forms a soft refractory insulating blanket on the metal. This confines the heat generated by the LIQUIDIZER and aids in maintaining the desired high temperature of the feeding metal in the heads or risers.

SOFFEL'S THERMOTOMIC COMPOUND

PATENTED

FOR ALL METALS and ALLOYS

THERMOTOMIC COMPOUND is a patented Exothermic compound that can be molded into any desired shapes and used as feeding ring inserts under risers or as facing application where it is desired to maintain fluidity of the casting metal. THERMOTOMIC permits reversal of the trend towards large feeding heads and risers, making it possible to use heads that are shorter and more compact with 1½" feeder openings.

This permits easy removal of the casting feeding heads and sharp reductions in cleaning and finishing costs. When THERMOTOMIC is used as inserts or as facing mixing with molding sand in the mold, heat at thin metal sections is retained until the thick main body of the casting has solidified, thus eliminating shrink cracks and improving grain structure and tensile strength. For use in green sand molds, use THERMOTOMIC W. P. (Waterproofed)

NOTE: SOFFEL'S CARBON FREE LIQUIDIZER NO. 5 is recommended for use on top of feeding heads in conjunction with THERMOTOMIC COMPOUND. For aluminum castings, use THERMOTOMIC ABC and AL-X31 LIQUIDIZER. When ordering a trial sample, advise the kind of metal to be used on.

U. S. Patents No. 2,490,327 and No. 2,500,097

PITTSBURGH METALS PURIFYING COMPANY

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WORLD'S LARGEST MANUFACTURER OF FLUXES AND PURIFIERS FOR ALL METALS AND ALLOYS

the ultimate in burner performance....

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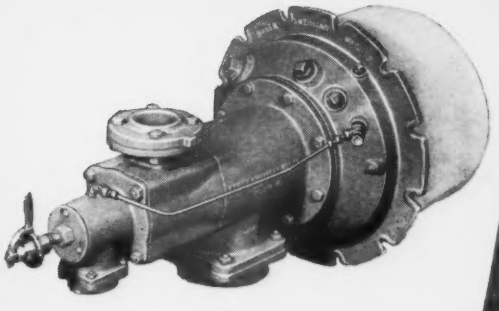
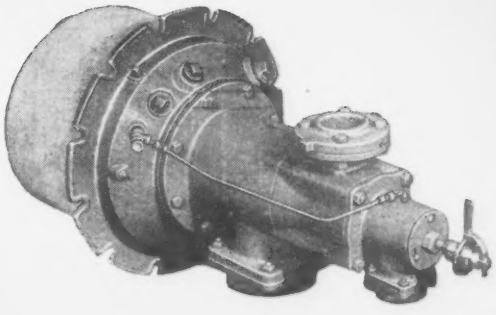
FIRE-ALL DUAL-FUEL BURNER





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Enjoys "Troubleshooting"

TO THE EDITORS:

I should like six copies of "How Many Castings in a Flask" by C. W. Ammen. The article discusses a subject that has been a perpetual source of controversy in our plant. I have enjoyed Mr. Ammen's work very much and believe it to be one of the best regular features of FOUNDRY.

I am also following the series by Harry St. John and I hope when he has completed this fine work that it will be available as a group of tearsheets or as a complete volume.

CHET L. MACK

Route 4
Jamestown, N. Y.

* * *

Seeks Patent Examiners

TO THE EDITORS:

American industry is facing long delays in obtaining patent coverage for products and processes otherwise ready for the market. These delays stem from the great increase in the number of patent applications filed during the past few years, coupled with the fact that the number of patent examiners has not kept pace with the increase in patent applications.

The patent examiner thus holds a key position in the advancement of American technology, and the only way to reduce these delays and clear the way for marketing the new products and processes is to employ new examiners.

Steps have already been taken in this direction. One hundred new patent examiners have been added to the examining staff since last June, and the Patent Office wants 300 in 1956. There are immediate openings for engineers and scientists who can accept appointments in Washington now.

Patent Examiners pass upon applications for patents in a wide range of technical fields to determine whether they are novel and whether invention is involved. This calls for a study of the issued patents and the related scientific literature. The Association points out that technical graduates who apply will find the job both interesting and stimulating and one which keeps them in close touch with the latest technical developments. The job offers opportunities for rapid advancement within the Patent Office. Washington also offers unusual opportunities to carry on graduate studies at the same time.

Salaries for Examiners start at $4345 a year, and it is possible to reach a salary of $7570 in five and one-half years, with salaries in excess of $13,000 available. The Patent Office also offers liberal vacations and sick leave and pension benefits.

Engineers and scientists holding a college degree in engineering or applied science, or a degree with a major in chemistry or physics, or with certain combined credits in these fields, are eligible for appointment as Patent Examiners, without examination, upon application to the Commissioner of Patents in Washington, D. C.

HENRY E. SHARPE
Vice Chairman
Committee on Public Relations
New York Patent Law Association

* * *

Service To the Industry

TO THE EDITORS:

Please send me a copy of the FOUNDRY index, volume 83.

Permit me at this time to compliment the staff of FOUNDRY magazine for the excellent articles and valuable service they are giving to the foundry industry.

ORMIE R. SCOTT

29 Glenwood Ave.
Guelph, Ont.
Canada

* * *

Chemist Is Needed

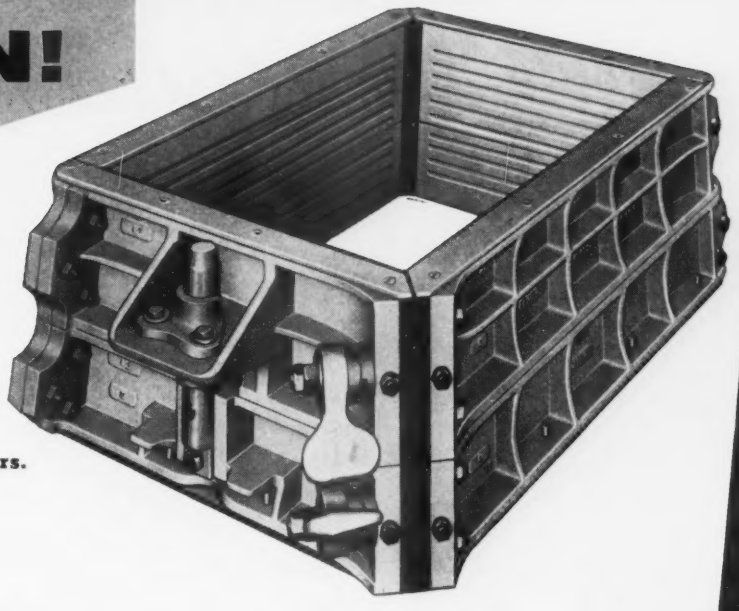
TO THE EDITORS:

On reading the article on page 206 in the January issue of FOUNDRY, I found myself in disagreement with the author. This was a surprise to me as I consider Mr. Ammen's contributions practical and useful.

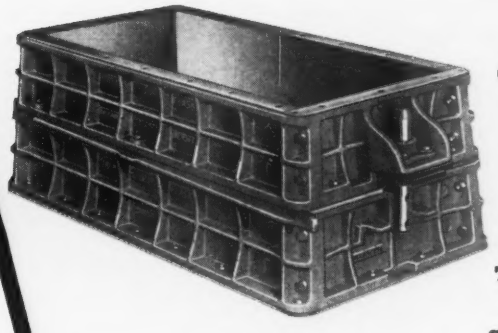
The idea expressed by Sam seems to take a lighthearted view of analytical chemistry as applied to metals, and, in my view, Charlie does the same thing, although he does qualify his subsequent writing by saying, ". . . although I am only what is known as an occasional metallurgist."

If Sam's foundry sends out for analysis one sample of bronze for six elements each day, the cost is likely to be close to the initial salary of a young chemist. If he needs three samples analyzed per day, the bill is likely to equal the further cost of running the necessary laboratory, including the amortization on the investment of $1500 for equipment such as a balance, fume cupboard, beakers and burettes and electrolytic

Performance PROVEN!



Fremont magnesium Spreadlock Flasks by actual use have been proved easier to handle . . . much sturdier than aluminum. They take abuse . . . last longer. Accurately machined, they assure more exacting work. The men like them. No sand can lodge in the corners. Gaps are completely closed by long-life, replaceable live rubber inserts.



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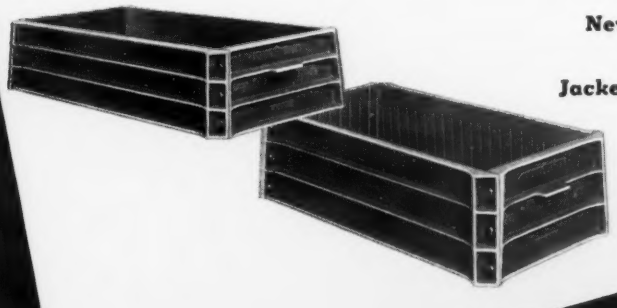
The foolproof GROOVLOCK pin on Fremont Standard Slip Flasks is the difference.

SAVE IMPORTANT MONEY



New sides or ends can be quickly inserted in Fremont Cast Iron or Cast Aluminum Jackets. Entire jackets need never be scrapped.

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High in carbon—low in sulphur—uniform in carbon absorption—low in ash—Matchless in performance!

You can always rely on Indianapolis Coke for maximum metal temperatures with minimum coke per charge. Available in four sizes to fit your cupola operations.

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apparatus, including platinum. This is making no charge for floor space or heating in winter.

While metallurgical analysis does become a matter of routine, it still requires some background training in chemistry, particularly if the operator is to be alone in the laboratory, away from the chance of consultation with a more experienced chemist.

Based on the premise of three samples, analyzed for six elements each per day (a very easy job for the chemist), it would appear that a capital investment would be justified. This being the case, it would certainly be to the interest of Sam's foundry to employ a young chemist. There also would be an opportunity for him to develop into a metallurgist and thus become more valuable.

Any attempt to get reliable information by setting up an elementary laboratory to be run by any of the present foundry staff, none of whom has training in analytical chemistry, is likely to be costly.

HAROLD J. ROAST
140 *Grosvenor Ave.*
Ottawa 1, *Ont.*
Canada

* * *

Dislikes "Technical Drivel"

RALPH L. LEE:

I got a great kick out of your January article, and how true.

I like to think that like you, I'm bitten by the foundry bug. Every piece of foundry literature I can lay hands on, I devour wholeheartedly, but how disconcerting, trying to assimilate the metallurgists' technical drivel.

I find myself often reassured by your articles since, although I'm probably half your age, I like to think I belong to the "old school."

You've probably read Thomas West's *American Foundry Practice* I and II. Great stuff, isn't it? He'd probably view with disdain shell molding, investment molding, CO_2 process, etc.—grandly referred to as progress. I wonder, is it?

Perhaps in 25 years, a "cope," "drag" or "odd-side" will be like so much Greek to foundrymen.

Well, guess I'll get back to my little aluminum hobby foundry in the garage and teach my 5-year-old a little more, and if, to a philosophical foundryman columnist, my punctuation is poor, we can blame an Eighth elementary education. Good luck to you, sir, and keep on with the good articles.

HUGH MCDOWELL
Glenmorris, Ont.
Canada

BIGGER loads—LESS spillage

new HA PAYLOADER®

"Our first 'PAYLOADER' purchased 10 years ago is still on the job. We now have 3 HA's in the operation. This new-design HA gets bigger loads with less spillage in travel. On the sand operation it averages 50 tons per hour on a 100 to 200-foot haul. We find 'PAYLOADER' tractor-shovels are built to give top production with minimum maintenance and repairs."

(Signed) L. COOPER
General Foreman of Foundry
C. I. Capps Company, Inc.
Jacksonville, Fla.

Many, many foundries and metal working plants have years-old "PAYLOADER" units and new-design model HA's. These long-time users, like C. I. Capps Company, have high praise for the endurance of the old and for the greater production of the new models.

If *you* want low-cost, high-speed handling of sand, chips, small castings and of many other items, it's a good time to get the facts about "PAYLOADER" — the original unit-design tractor-shovel. Your "PAYLOADER" Distributor is ready to show you.

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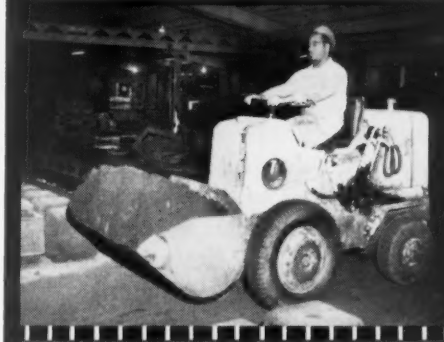

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WHEREVER METALS ARE CAST . . . FOUNDRY
April 1956

A Guide for Congress

Since scrap is the principal source of metallics for ferrous foundries, anything affecting the supply has a direct bearing on the ability of foundries to meet demands for castings, for a nation either at peace or at war. For some months foundrymen in various sections of the country have been greatly concerned over the unlimited exportation of iron and steel scrap, as permitted by the Department of Commerce. This movement of scrap from the country has resulted in shortages in some areas, a diminishing supply of quality scrap and inflationary tendencies in prices.

As a result, foundrymen and representatives of other industries using scrap have been telling the Congress about the problem. And because the members of Congress generally are sensitive to word from back home, it was quite natural for the House Banking and Currency Committee to hold a hearing on scrap exports when considering a bill to extend the present authority of the Department of Commerce to regulate exports.

On Mar. 6, at the invitation of the committee, F. Kermit Donaldson, executive vice president of the Steel Founders' Society of America, Lowell D. Ryan, managing director of the Malleable Founders' Society, and Donald H. Workman, executive vice president, Gray Iron Founders' Society, testified before the committee in Washington. Excellent and convincing statistics provided by these men were well received by the committee, and emphasized again the value of well organized and efficiently managed trade associations to the foundry industry.

Recommendations of the three representatives were summed up as follows:

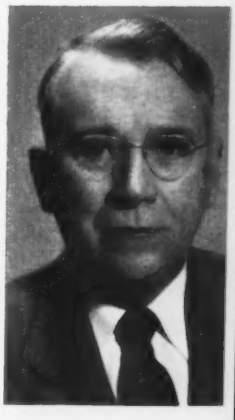
1. Launch a comprehensive and objective study of the potential scrap supply likely to exist in the next 5 to 15 years.

2. Make an immediate analysis of steps which could be taken to limit the total amount authorized for export, with the limitation imposed on a qualitative basis.

3. Work out a program — with due regard to foreign requirements and commitments — whereby these foreign countries can (a) be encouraged to increase their pig iron producing facilities, and (b) be encouraged to use other than top quality grades of scrap.

These recommendations surely are reasonable and constructive. They should be considered carefully by the Congress in order that foundries and steel mills may produce the castings and other iron and steel products needed for the normal expansion of our growing economy in times of peace, or for the defense of the nation in time of emergency.

Frank G. Steinebach
Editor



Gating...

Affects Quality in Production of Steel Castings

This paper surveys types of gating for steel castings. It originally was presented last year at a regional technical and operating conference of the Steel Founders' Society

By HUBERT CHAPPIE
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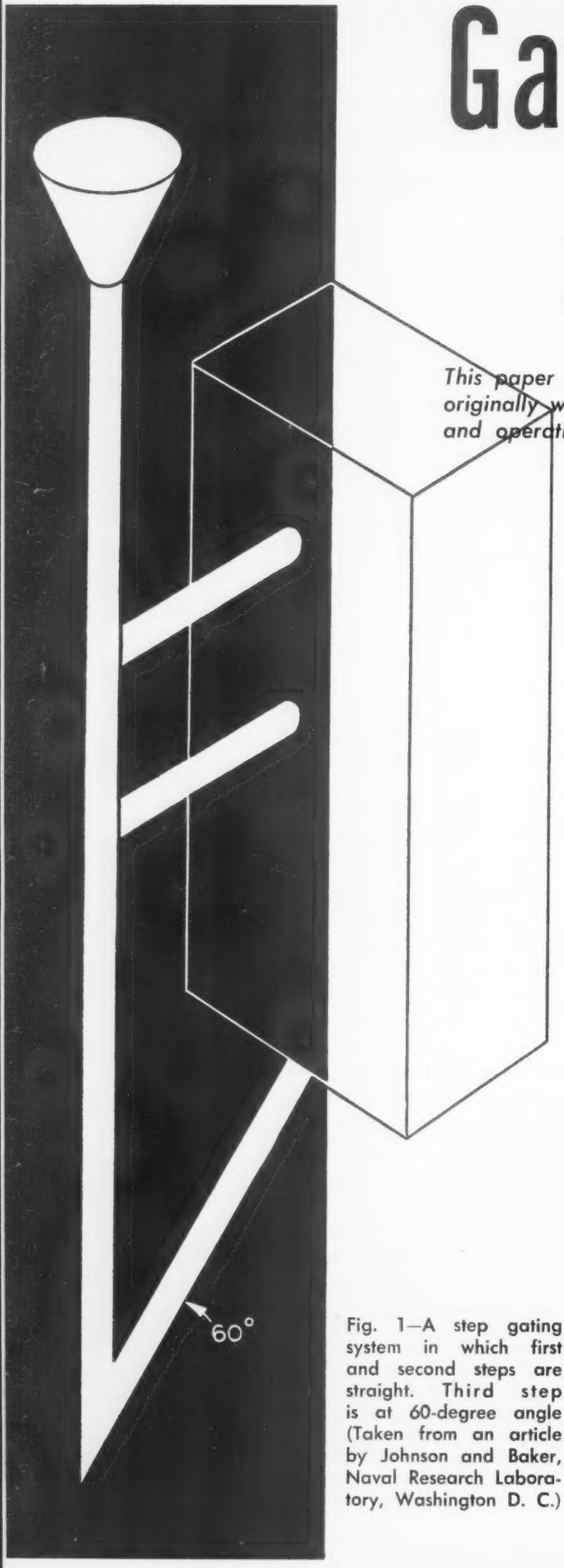


Fig. 1—A step gating system in which first and second steps are straight. Third step is at 60-degree angle (Taken from an article by Johnson and Baker, Naval Research Laboratory, Washington D. C.)

IMPROPER gating can contribute to sand inclusions, hot tears and dimensional instability in steel castings. Sand inclusions can increase machining costs. The carbide cutters used today cut with a surface speed of 250 to 600 fpm, compared with the high-speed cutters used formerly at 50 to 100 fpm. Carbide cutters are relatively brittle and tend to break when their work is interrupted by sand inclusions. They also become dull when cutting sand, necessitating tool changes.

The sand inclusion defect in castings must be minimized or eliminated entirely if machining costs are to compare favorably with those for weldments or forgings.

Gate Thickness Important—Thickness of the gate is important in relation to casting thickness at the junction, because the wrong ratio does contribute to hot tearing. Also, the gate must be well filleted to avoid sharp corners which will induce cracks.

In a complicated casting of many sections and cores, incorrect placing of the gate contributes to hot tearing and affects dimensions. The gating may hold certain sections rigid and prevent normal shrinkage.

The gate itself, especially when patterns are mounted, generally is made of wood. When properly rammed it produces a good surface. When making molds from loose patterns, the gate usually is cut by the molder; this naturally does not produce the hard, well rammed surface that a gate pattern produces.

Some gates when mounted are placed on drag and cope boards, half the thickness in the drag and half in the cope. This practice provides a good rammed gate; however, if the gates do not match perfectly and there are sharp edges of sand, the advantage of rammed gates is lost.

Tile or refractory down gates are very satisfactory, providing they are not spalled by molten metal. This can easily happen when tile is moist.

There are many different tile materials. Here is a good practical test to ascertain if tile spalls: Place two or three sections in a sand-rammed flask and pour directly into the tile. If the tile spalls, the residue will float to the top of the metal. It also might be beneficial to keep tile in a warm place before using. Some foundries do this with their bottom-pour stopper assembly. The storage area usually is a small room with one gas jet which keeps the room at slightly elevated temperature.

Many different sand mixes are used for cored gates. Some cores are blown. This can be very satisfactory if one is positive the mix will not produce any erosion of sand.

Many foundries use strainer gates or their own trap gates to prevent loose sand from entering the casting. It would seem that the foundry admits by these measures that loose sand or inclusions result from ladle practice or inferior gating practice. Perhaps a check on ladle practice and the sand formula used for the gate would provide the remedy.

When gates are made with core sand the core-boxes should be whole; or, if half boxes instead of pasted cores are used, green top the top part of the gate, core and then dry both halves together. This may necessitate drying the bottom part of the core twice. However, with this practice, compared with a pasted joint, the green top makes a much smoother assembly and in some cases it is hard to see where the two halves join. Pasted cores can be blamed for some loose sand inclusions in castings.

Gating Practices Vary—There are many different gating practices, and some are contradictory. It seems, however, that each foundry must establish the gating practices which experience shows is best suited to its particular operations.

For those interested in gating, reference can be made to *The Metallurgy of Steel Castings* by Charles W. Briggs, pages 249 to 276 inclusive. Here are the first four paragraphs:

"Considerable importance is attached to the manner in which molten metal should enter a mold. Steel foundrymen have long been aware that a successfully made casting must be properly gated. The purpose of the gate system is, primarily, to furnish a means of allowing the steel to enter the mold. Although this is the main purpose of a gate, there are other functions that a gate can and must perform.

"A study of the operation of pouring a mold will show that the aims are 1) to fill the mold cavity completely, 2) to avoid the deterioration of the mold by the liquid metal, and 3) to establish proper temperature gradients in the mold so that the gate will not be responsible for the occurrence of contraction cavities in the casting.

"Measures to be taken to accomplish the desired aims include the control of 1) the filling method, i.e., the manner by which the liquid metal is transferred from the ladle to the mold, 2) the type of runner that controls the disposition of the gates

Fig. 2—Ingot mold which weighs 46,000 lb was gated at the bottom and four contacts were used

Fig. 3—Bracket weighs 146 lb, is another good example of results possible with bottom gating

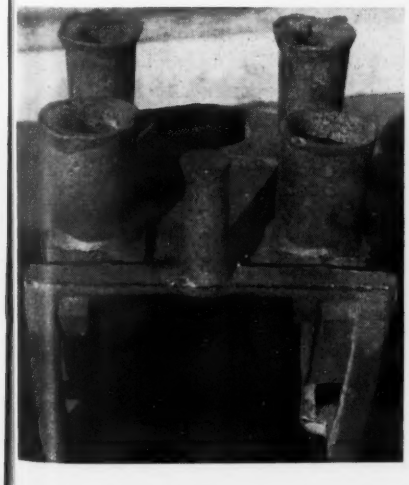
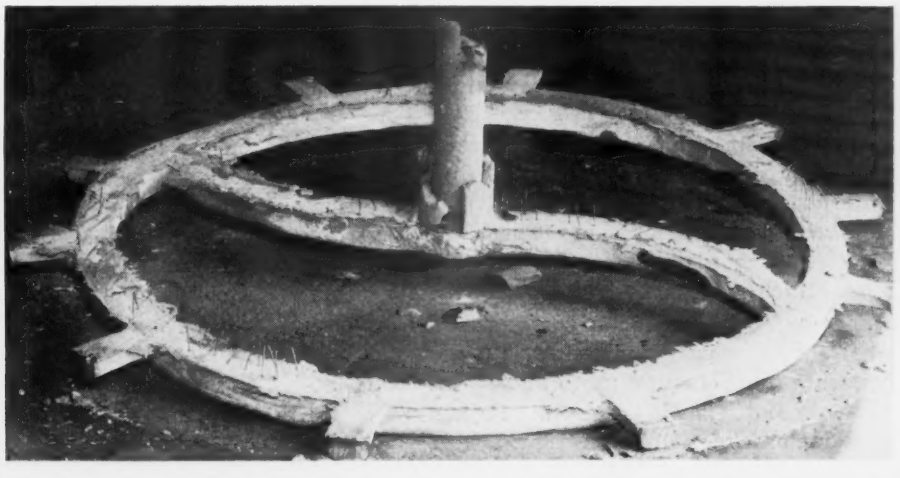


Fig. 4—Circle gates give fine results in ring castings and gears. This one is 8 ft in diam



carrying the liquid metal into the main mold cavity, 3) the position, dimensions, and number of gates entering the mold cavity, 4) the rate of pouring, 5) the position of the mold during casting, and 6) the temperature and fluidity of the metal. Pouring is an important phase in making a casting and often has a preponderant influence on its successful production.

"The gate system, besides filling the casting with molten steel, also may function as 1) a venting system for the removal of gases from the mold, and 2) a riser, to furnish liquid metal to the casting to compensate for volume losses due to liquid and solidifying contraction."

A paper, "Gating Systems For Metal Castings" in the AFS *Transactions,* of 1948, by W. H. Johnson and W. O. Baker, discusses top pouring, finger gates, whirl gating, riser gating, horn gating, bottom side gating and step gating.

The authors' conclusions on step gating were rather revealing. Most foundrymen have used various types of step gating, thinking that the metal would follow the proper sequence in gating. Johnson and Baker found only one type of gating which followed the pattern desired. This pattern had three steps, with the lowest step inclined upward 60 degrees from the horizontal. The metal first entered the mold through this step and, as pouring continued, the second step fed when the metal level reached it, and also the first step acted in the final sequence. (See Fig. 1) Here are the writers' conclusions:

"Whirl, riser and horn gates were ineffective in preventing turbulence in the mold. In multiple finger gating systems often most of the feeding was accomplished by the fingers farthest from the sprue. When all the fingers did feed uniformly, a rolling type of turbulence appeared in the mold. With step gates only one design showed feeding in the desired sequence. No gating system prevented turbulence."

Other good references on this subject are: "Principles of Gating Design" by W. H. Johnson, W. O. Baker and W. S. Pellini, AFS *Transactions*, 1950; "Principles of Gating" by the same authors, FOUNDRY, October, 1950; and "Choke Control in Finger Gating" by W. H. Johnson, H. F. Bishop and W. S. Pellini, FOUNDRY, April, 1951.

The single gate or one lead-in gate is the type of gate the steel foundry should not use. It promotes scabs and erosions. Research has shown that multiple gates produce a better surface on castings with less sand erosion.

The use of the horn gate seems to be disappearing rapidly from the steel foundry. The horn gate, with the small end attached to the casting, does produce mold erosion. There would be less erosion if the large diameter of the horn gate were attached to the casting.

The swirl gate is not a good gate. It has only one lead-in, which contributes to a hot spot and prevents temperature uniformity. Its swirl action promotes mold erosion. It has been the writer's practice, while associated with a foundry making large work, to replace the swirl gating with bottom gating and secure definite improvement in quality.

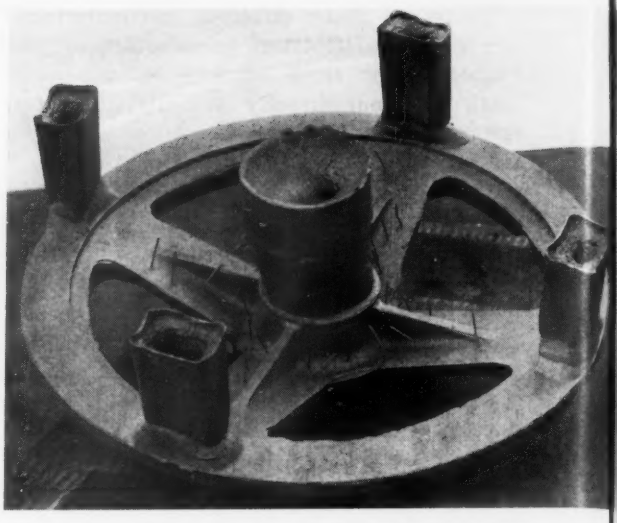


Fig. 5—Spider weighs 372 lb. No gate was used. Metal was poured directly into the center head

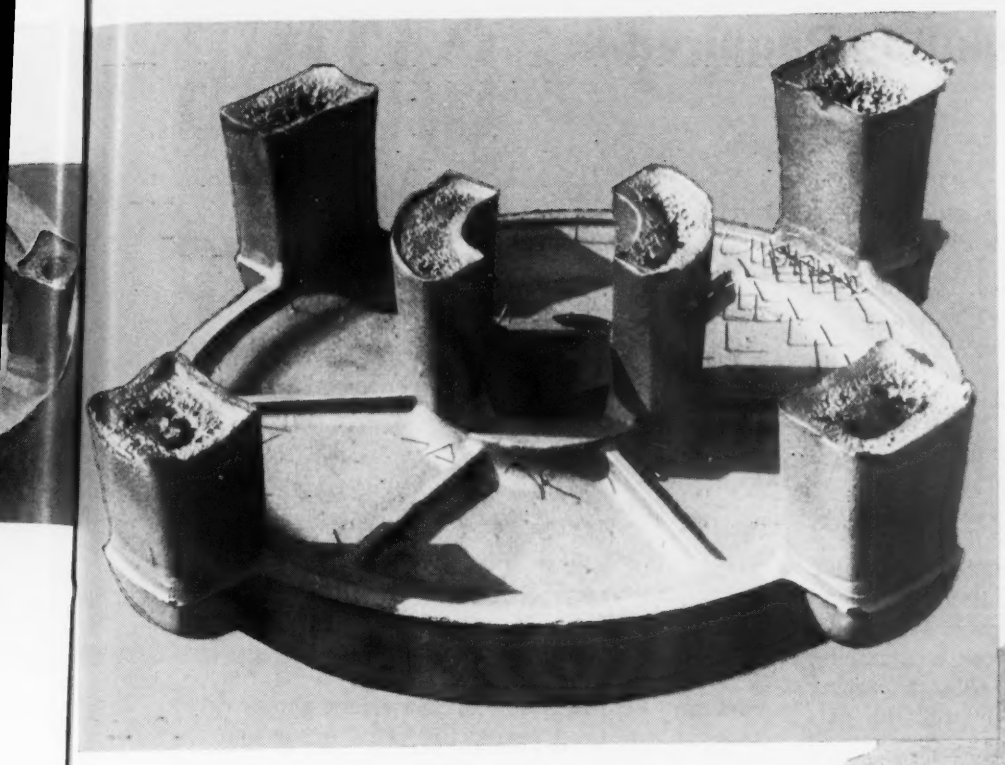
Multiple Gating—Now let us consider some examples of good gating.

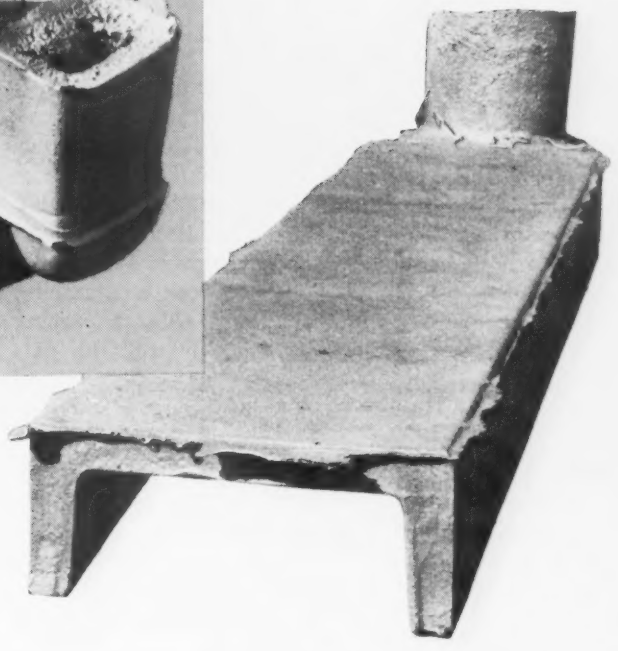
Multiple gating is excellent—two ingates are better than one, and in many cases four, six and eight contacts can be used. Naturally, for large castings this can be done readily and it promotes temperature uniformity. It makes for less erosion and penetration.

In making any casting having a flat surface, multiple gating is employed either at the parting line or under the drag with bottom gates. In making this type of a casting we have improved our surface by positioning the mold so that metal coming in does not immediately spread out and cover the entire drag. The mold is tipped 10 to 15 degrees, gate down. This practice insures a much better surface on a flat casting.

Bottom Gating—Bottom gating has given the best results in pouring large castings. Actually there are probably two interpretations of bottom gating. If a casting is gated in the drag from any side of the casting, it is considered bottom gating. However, when we refer to bottom gating we go under the drag part of the pattern and make contact with the bottom surface either with two or more leads. The action of the metal coming into the casting does not erode over the surface as a side gate. This does require more molding time and sometimes an extra flask, but we feel we have been compensated by the surface quality of the casting.

Circle Gates—Use of circle gates for ring castings or gears has given us exceptional results. The metal is poured through a 5-in. down gate and is connected in two places to the circle. The metal fills the circle and then flows into the casting through 8, 10 or 12 ingates. The metal is distributed uniformly, and velocity is reduced considerably. Despite the long length of travel over





Figs. 6 and 7—These castings also were poured directly into the head. Many in the range of 50 to 6000 lb give excellent results when poured in this fashion

a cut sand gate, these castings have been exceptionally clean.

It is important that the metal gets in the circle gate fast enough or the metal would run from only two or three leads instead of eight, as provided.

Some time ago I visited a foundry making shell molds with zircon sand. All castings were poured into the heads. The foundry superintendent said that since he did not have too many years of experience he didn't know any better so the metal was poured into the heads. The castings were satisfactory and no gates were needed.

My experience, perhaps, is no different than that of many foundrymen. Whenever some mishap took place and the gate would not take the metal, we poured into the head. Result—one scrapped casting.

However, changes do take place and, we hope, for the better. Some castings are poured through the head with results that are almost unbelievable The weight range poured into the head is from 50 to 6000 pounds. In most cases a favorable condition is created by removing the center core of a hub which is connected with a wheel, flange, sprocket, etc. Figs. 5, 6 and 7 illustrate castings poured into the heads.

When pouring into a head, roofing nails are placed in the sand where the metal first strikes the mold surface. If the sand has the properties it should have, nails should not be necessary. However, it is added insurance in preventing the occasional casting from having a scab. One can, if he desires, place zircon sand at the place where the metal first strikes the mold. Whenever pouring into the head the casting is cleaner than if poured into a gate.

The extra cost of boring the hole in the center hub and the additional metal used is more than offset by the core costs and the extra molding time to place a gate into a mold. There are also some intangible gains.

Eliminating the core prevents gas formations, the possibility of inclusions from a pasted core, core penetration or core shift. It also means less close up time in securing the core and fewer cracks around the heads. Usually two heads are placed on a hub with a core. Without a core, one head is used. This head covering the complete hub allows no room for sand inclusions to collect on the hub face.

It is much easier to feed a solid hub with one head than a cored hub with two heads. The cleaning room can remove the one head with a torch and no further grinding is necessary. When two heads are used the head must be ground flush as the machine shop does object to intermittent cutting. The best gradient temperature is accomplished in pouring into the head. Cold metal is at the bottom of the casting and hot metal is where it should be—in the head.

In conclusion let us not condemn any type of gating because of sand inclusions, when perhaps the sand formula is not what it should be or possibly the molds are stored and closed for too long an interval before pouring.

Skill is Required in

GATING BRONZE CASTINGS

It isn't easy to make sound manganese or aluminum bronze castings with a smooth finish. Here's how one foundry gated some parts and got such results

HOW to produce manganese or aluminum bronze castings that are sound of limb and free of wind—and still possess a "skin you would love to touch"—poses a problem for the jobbing foundry that taxes the molder's ingenuity. He has a tenacious film-forming liquid metal to pour which froths at the least commotion or disturbance and clings to mold surfaces if not moved at an adequate rate. He must try to devise a plumbing system to run this liquid from ladle to casting and avoid picking up gas or sand from the gating system he devises.

Manganese or aluminum bronzes, with their propensity to form a viscous, sticky aluminum oxide film on the liquid when in contact with air, act something like a varnish or oil. They must be bottom-poured to avoid picking up air which later is expelled as a foam or else stays trapped in the liquid to form bubbles. In the latter case the bubbles show up as pits or pinholes in the solidified casting.

Some foundrymen successfully top-pour castings of these metals. A few succeed with tin bronze gating systems in special cases. Some shops prefer to reduce the velocity of the metal at the mold by shortening the distance of metal travel and gating into a combined relief sprue and skim gate from which a "reverse" horn gate enters the base of the mold or combined riser-mold. Most shops use the traditional bottom-pour, non-turbulent — reverse horn-gate principles, accompanied by traps, dams and screens to eliminate dross.

When the surface or skin of the casting is of paramount importance, it is normal for the foundry to add more traps and dams and screens to the gating system to filter out the dirt and dross. Then, with a quiet, non-turbulent flow, the gating system will pass along only the clear liquid so that it may freeze to form a casting with a smooth, slick skin.

Examples of skillful work of this kind are illustrated in the following three castings taken from the floor of the Somerville Machine & Foundry Co., Somerville, Mass.

First is a tapered ring with a minimum wall thickness of 1 inch. The dimensions of the runner system appear in Figs. 1A and 1B. The pouring sprue delivers to an open top skim gate at which point the flow is choked down to one-third its volume and passed along to the skim-bob where a horn sprue takes over to enter the bottom of the casting. An inspection of the risers shows dross topping the down sprue, the relief sprue and the tops of two of the risers which were farthest from the point of entry. The lengthy runner system was apparently delivering clean metal, and the scourings from the mold itself were flushed out of it and into the risers. A yield of 60 per cent is not unusual for castings of this type.

Figs. 2A and 2B show the 12-in. OD gear blank similarly processed in molding. In addition to the strainer core at SG which traps the incoming dross and reduces the flow 50 per cent, there are at least four dirt traps in the sprue system and in the runner extensions at RE(a) and RE(b) as well as at the throat of the horn sprue C and the skim bob SB prior to entering the 6-in.-diam riser by way of the cross gate XG.

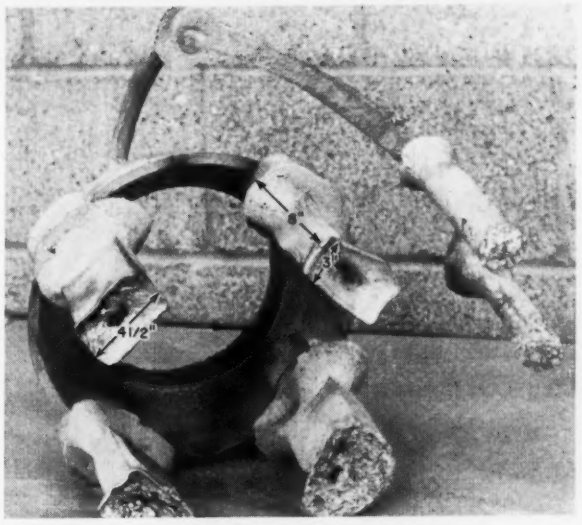
Figs. 3A and 3B show a 30-in. OD gear blank with a gating system similar to that of Fig. 2. Some dross appears at the heel of the riser topping the skim gate, but most of the remaining runner system remains clean even though five traps SG, RE(a), RE(b), SB and C are set into the path of the metal stream before it reaches the combined feeder and casting.

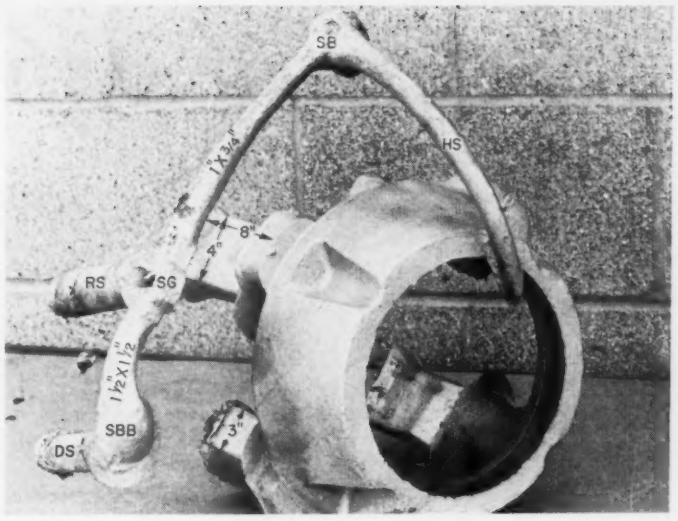
It is interesting to observe in Fig. 3 that the use of a chill opposite the riser served to eliminate the need for two additional risers and increased the yield to 60 per cent from what might have been a 40 per cent yield.

A summary of casting dimensions and weights:

Part	Approximate Dimensions	Approximate Weight, lb Gross	Net	Yield %
Tapered ring	Diam 24 in., top, 18 in. bottom, height 12 in., thickness 1 in.	270	170	63
Spoked gear	OD 12 in., hub 6 in., face 4 in.	240	112	47
Ring gear	OD 30 in., ID 12 in., face 4 in., thickness 2 in.	460	270	60

At Somerville, Mass., the Somerville Machine & Foundry Co., which supplied these illustrations, is operated by Frank Volpe Sr. and Frank Volpe Jr., with Dan Sutherland as foundry superintendent.

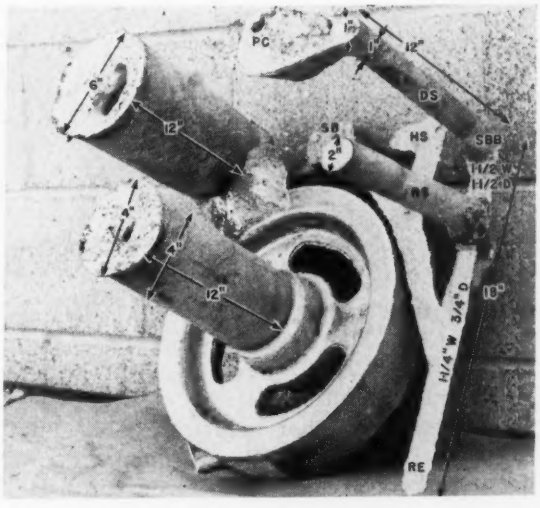




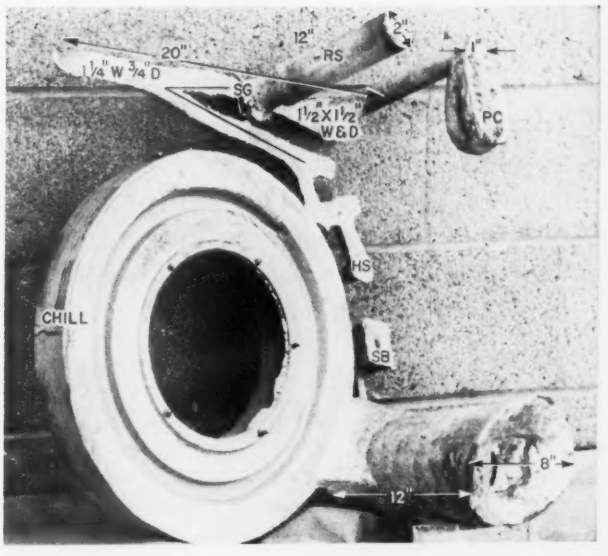
Figs. 1A and 1B—Tapered ring casting has a minimum wall thickness of 1 in.

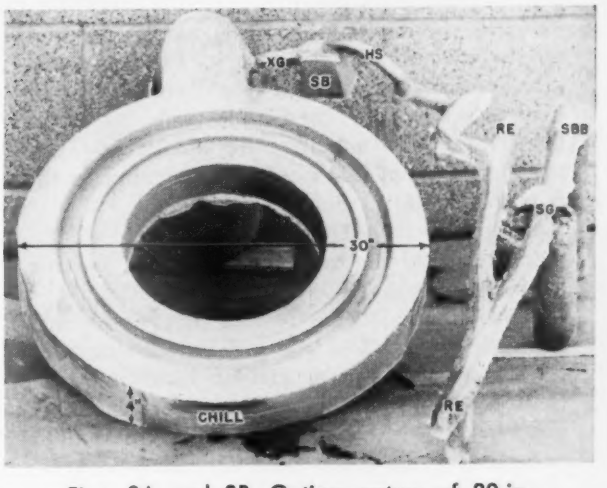
KEY TO SYMBOLS

DS—down sprue	RS—relief sprue
HS—horn sprue	SB—shrink bob
PC—pouring cup	SBB—sprue basin
RE—runner extension	SG—skim gate
REE—riser extension	XG—cross gate



Figs. 2A and 2B—Gear blank with 12-in. OD was molded in same fashion as the ring

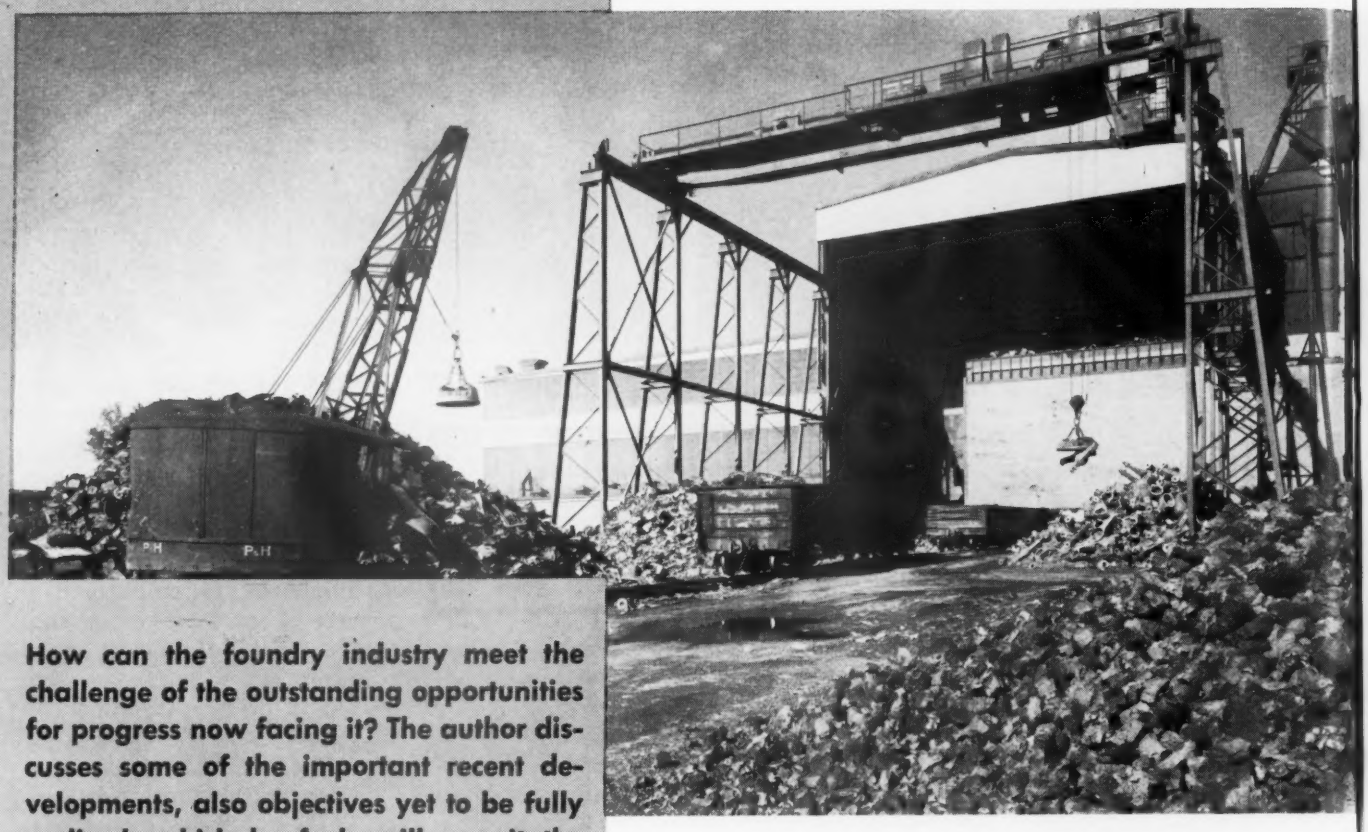




Figs. 3A and 3B—Gating system of 30-in. OD gear blank is similar to that of 12-in.

By JAMES H. SMITH
General Manager
Central Foundry Division
General Motors Corp.
Saginaw, Mich.

Opportunities



How can the foundry industry meet the challenge of the outstanding opportunities for progress now facing it? The author discusses some of the important recent developments, also objectives yet to be fully realized, which he feels will permit the meeting of this challenge. These activities lie in the fields of metallurgy, manufacturing and personnel

SINCE 1921, Central Foundry Division of General Motors Corp. has grown from a one-plant operation with about 800 employees to three plants with 10,000 employees. Most of this expansion has been during the last decade. In our division, we have been talking a lot in recent months about "meeting the challenge"—that is, the challenge of outstanding opportunities that lie ahead of us in the foundry industry.

Very recently I asked my staff what they planned to do in their various fields, particularly in 1956 and on to 1960, to enable them to meet this challenge. The results impressed me tremendously, and I would like to discuss some of the things they presented as most important in the fields of metallurgy, manufacturing and personnel. Objectives were presented for many other areas, also, but space does not permit coverage of all of them.

Annealing Malleable Iron—Since 1938, we have decreased the time required to anneal malleable iron from 60 to 23 hours by applying our knowledge of the effect of small percentages of various elements on the graphitization rate of white cast iron. We expect to further reduce the annealing cycle to about 15 hours. We will make every effort to anneal all of our products on the basis of a 16-hour day, five days a week. Success will enable us to apply the continuous-flow principle of manufacturing more effectively.

For many years, we have been trying to make an as-cast malleable iron—that is, one produced without annealing. Very little progress was made until this last year, when we produced some iron which contained about one-half of the total carbon as nodules in the as-cast state. To date, our work shows a great deal of promise. This is a long-range program, and every effort will be made to carry it to a successful conclusion as rapidly as possible.

Cupola Operation — Everyone is familiar with the extremely high cost of cupola repairs. To help reduce this cost, we plan to try to operate our cupolas for one week without repairs. Melting will be on water glands instead of refractories. This change will require the use of projected water-cooled tuyeres with hot-blast temperatures up to 1000° F. We believe there is a good pos-

of the Future

sibility that this objective can be attained.

Another objective will be to expand the use of humidity control. We have used humidity control on our malleable iron cupola blast for many years with highly satisfactory results. We now plan to use the same control in our gray iron cupolas. We hope by doing so to get more uniform iron, a substantial coke saving and lower cupola charge costs.

Still another goal will be to employ as many low-cost cupola charge materials as possible by using a greater percentage of briquetted borings and exploring the use of briquetted steel turnings. We also will examine possibility of adding gray iron borings and steel turnings without briquetting through the use of a new method known as the Roxy process, which blows gray iron borings and steel turnings through the tuyeres of the cupola at a point where the iron is melting.

We also want to make thinner walled castings of good design, resulting in a reduction of casting weight. We believe that by improving our cupola operation through the use of the cupola electric duplexing process, we will be able to obtain hotter and more fluid iron which will enable us to pour thinner walled castings successfully. We believe that by doing this, we will continue to make in iron many castings which might otherwise be converted to nonferrous material.

Continuous-Flow Manufacturing—One of our goals will be to apply more effectively the continuous-flow principle of manufacturing. Some progress already has been made, particularly in the foundry departments. There we have combined a continuous supply of cores, molding sand, iron and molds flowing onto a powered conveyor. Out of this system has come a high-quality, low-cost product never possible with the old batch method of floor molding. Over the years, we have reaped benefits from continuous-flow manufacturing, but much more remains to be done.

Shell molding will contribute greatly to progress made in continuous-flow manufacturing. At our Defiance O., plant, for example, we are making camshafts in shell molds. About 60 shells per hour are made on blow hot press shellmaking machines.

They are placed on a pendulum conveyor for pouring, then go to the shakeout, where an automatic transfer device pre-positions the gate of castings for automatic pickup by the cooling conveyor. The cooling conveyor then transports the gate of castings through the cooling area and through a cleaning cabinet, where the castings are cleaned by a sand method developed by our engineers. This method does not destroy the smooth finish characteristic of shell castings.

The castings then are taken on the conveyor to the debobbing operation, where the gate of castings is removed from the conveyor and the four camshafts debobbed simultaneously. At this point, the castings are inspected, then picked up automatically by a storage conveyor and transported to milling machines, where a milling and centering operation is performed.

A transfer device picks up the milled camshaft from the mills and places it in a cam hardener. After hardening, the shafts are deposited automatically on a table, where the final inspection takes place. Another part, made in shell molds, to which the continuous-flow principle has been applied effectively is automotive crankshafts made of pearlitic malleable.

We are sure you can see the advantages of this type of manufacturing over previous methods used. The application of the continuous-flow manufacturing principle will be pursued vigorously in all of our plants.

Shell Mold Process—Another objective will be further development of the shell mold process, in which the division became interested about seven years ago. It then was a new method some people believed to be another dream of an over-enthusiastic engineer. We felt that it could be a method of producing castings of superior quality, something we had been seeking. After much experimental work and four years of production, this process not only has fulfilled our expectations, but has offered to us a vast new field for development in our industry. The greatest improvement has been in the mechanization of the process.

Initially, as a manual operation, we could make only a few shells per hour. Later, a machine was designed and built in Saginaw on which one man could make about 30 shells per hour. Just recently, a new machine known as a "blow hot press" was developed by our engineers and the General Motors research staff, and one man now is capable of making 60 camshaft shells per hour. We are sure that with further development the machines will be capable of making 90 to 100 shells per hour. Also, we are able to make much thinner shells with this new method, substantially reducing the cost of the materials used.

Four years ago, we thought that the advantages of the shell process were primarily in the manufacture of small parts. We now are producing, however, a wide variety of castings ranging from valve rocker arms weighing a fraction of a pound and camshafts weighing 10 lb to V-8 engine crankshafts weighing 70 lb. The following production figures for the last five years and our tonnage forecast for 1956 will give some idea of the tre-

mendous growth the shell process offers: 1951, 3 tons; 1952, 650 tons; 1953, 3,700 tons; 1954, 6,500 tons; 1955, 20,500 tons; 1956, 63,000 tons.

Shell Cores—In the last year, much progress has been made in the use of shell cores in green sand molds. We believe this process has tremendous possibilities. A core made by the shell process is ready for use shortly after removal from the corebox; therefore, much of the present-day equipment needed in the coreroom and a great amount of trucking and handling of fragile sand cores can be eliminated.

The high cost of the phenolic resin used in the process has been one stumbling block to a greater application of the process. We are carrying on a very aggressive program to find a substitute material. We also are working on methods to reduce the amount of resin and the material cost so that it will not be too great an obstacle in the further development of this process.

High-Pressure Molding—Another development on which we are working on is diaphragm or high-pressure molding. Our studies indicate that this method of green sand molding has a definite advantage over other methods in the manufacture of certain types of small castings. Hardness of pressure molds is highly uniform, a property which produces quality castings of close dimensional tolerances. Molds can be produced at a high rate without noise, vibration and heavy jarring. As a foundry technique for producing better castings at a lower cost, diaphragm molding cannot be overlooked, and we intend to explore its possibilities in all of our operations.

Quality Control—No. 1 objective in manufacturing is to produce the finest quality product at the lowest possible cost. The need for improved quality in our products is quite apparent if we are going to remain competitive. The continuing effort to mechanize machining operations is forcing us to supply high-quality castings consistently held to close dimensional tolerances. To attain this objective, we must raise the level of management thinking in all areas, with the ultimate objective of enlisting the willing effort of all hourly-rate people, working together as a team for quality. Constant top-management emphasis will be applied through training and improved communications between the foreman and his employees.

Quality control now is firmly established in all of our plants and is proving to be a valuable tool for management. Its use will be further expanded and improved throughout all of our operations.

The feed-back principle will be used more ex-

Pouring shell molds on a continuous conveyor. After they have been poured, the molds are left on the conveyor for a short period to permit them to cool

tensively to keep defectives at a minimum before corrective action is taken. Continuous samplings of castings taken as close to the shakeout as possible will be cleaned for inspection, and information pertaining to such defectives will be relayed to the molding and pouring areas for immediate correction.

The objectives outlined will be difficult to achieve, but they are attainable. We are sure that our manufacturing departments will be ready to meet the challenge of the unlimited opportunities ahead of them.

Personnel—The most valuable single resource of any organization consists of the skills, capacities and creativeness of its employees. For the sake of contributing to the greater well being of each individual, and to strengthen any organization, we must do an effective job of administration and training. We must pass along information, develop skills and modify attitudes so as constantly to improve the job performance of each employee.

The No. 1 personnel objective in any organization must be the building of a strong management team. We must plan for replacement, expansion and strengthening of the management group. We must realize the importance of lead time, for the supervisory positions today require training and abilities which cannot be developed overnight. In our planning, we must constantly be raising our sights toward new and bigger goals and provide an adequate supply of men with potential to assume the ever-increasing complexities of management responsibilities.

To accomplish this objective, we must have a formalized management manpower planning program. This will implement the basic personnel objective of having the right people in the right places at the right times. The program must start from a base of information which provides factual knowledge of future manpower requirements, specific with respect to numbers, and kind of jobs involved, and factual knowledge of present manpower—how it is being utilized, performance, potential, etc.

Having adequate information in these two areas available in readily usable form at all times is the key to planning successfully to meet further manpower requirements, whether they be up or down. As an example, our division has forecast its supervisory needs through 1960. By analyzing our previous turnover experience and additional requirements caused by projected expansion, we know what our manpower needs will be. If our forecast figures hold true, in 1956 we will have 69 opportunities to improve our organization.

In such a program, one naturally is concerned as where to get the additional manpower needed. Some must be new hires on direct assignments, but we should keep this number as low as possible, in order to adhere to a "promotion from within" policy. Transfers and promotions from the lower levels will account for many. Each year we have found that the technological advances in our business require more college trained men.

Some of our jobs are filled by men with General Motors Institute background and others are filled by recruiting at colleges and universities through the country. We pay particular attention in our recruiting to those schools which provide graduates with a sound background in the fields of metallurgy and foundry technology.

Example of improved handling operation. The blown cores shown at bottom resting on drier are raised by a platform which travels both upward and laterally to a convenient height. Operator then transfers cores to oven racks

There are 16 colleges and universities throughout the country which provide their students with such background through the grants made to them by the Foundry Educational Foundation, Cleveland. The foundation is supported by funds received from foundry organizations all over the country. More such financial support is needed so that this important work can be continued.

We must regard our progress in the past as a prophecy of the future. We must visualize our people, not only as they are now, but as they can be developed. We must determine and supply the training necessary to increase their flexibility and provide for their greatest utilization. Their resulting development will furnish them with personal satisfaction and raise the performance level of the organization. This program will insure that the foundry industry not only will continue to exist, but will continue to lead.

This is a great new competitive era we are entering, and we welcome it, for we firmly believe that if we meet the challenge that faces our industry, we can keep the casting process where it belongs by right of its inherent advantages—out in front!

By W. HAGEDORN

PROPER HANDLING CAN REDUCE PATTERN

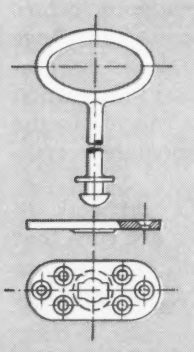


Fig. 1—A lift-out key and plate for smaller patterns

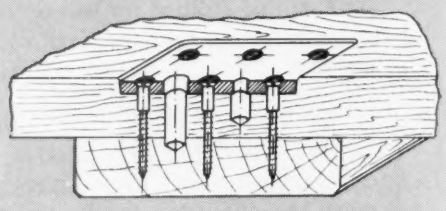


Fig. 2 — Lift-out provision and rapping plate combined

FOUNDRY patterns, especially those made of wood, are subject to mechanical wear and tear in addition to the effects of humidity and heat. With constant use, the surface of a pattern deteriorates and causes roughness and dimensional inaccuracy in castings.

The cause of pattern wear is not always natural deterioration, which is, after all, unavoidable. Damage frequently is caused by careless, rough handling of the patterns. For that reason, all points subject to great wear should be strengthened and protected adequately.

Studies of damaged pattern equipment have shown that rapping, lift-out and handling provisions often are either poorly executed or overlooked entirely. If a molder does not find these essential facilities provided, he is forced to improvise, and because his earnings frequently are based on his production, he is likely to be more concerned with speed in removing the pattern from the mold than in giving it special care.

Where there are few eyes or lugs, a molder may insert a spike in the joint face and twist. This practice causes destruction of the wood fibers and impairs the accuracy of the pattern, necessitating frequent, costly repairs. To avoid such expense, foundries should insist upon proper provisions for rapping and lift-out and for iron hangers on all new pattern equipment. Avoidable wear on patterns in the foundry thereby is minimized, and the molder's productivity is increased.

The handling facilities on patterns shown in the accompanying illustrations have proved themselves and can be recommended for practical application.

Fig. 1 shows a lift-out key and plate. These are available in various sizes and are used principally with small to medium-sized patterns. For patterns of this size, a combined rapping and lift-out plate often is used.

The plate shown in Fig. 2 may be made in the foundry. The smooth bore to receive a spike and the threaded bore for the lifting screw are combined in one plate, located at the center of gravity of the pattern and fastened with several wood screws.

With larger patterns, it is advisable to separate the rapping plate and the lift-out provisions. Fig. 3 shows a special rapping plate suitable for heavy and large patterns. The center bore is formed so that the curvature is gradual, thus providing a collar on the underside which helps to seat the plate properly in the pattern. Smooth bores with sharp edges have been found unsuitable, for after several rappings a burr is formed which must be removed periodically. In this connection, it is important to point out that the wood screws must be fitted and inserted into the plate correctly and with proper tools.

Fig. 4 illustrates the correct method of boring. First, a hole 0.02-in. smaller than the root diameter of the screw should be drilled the entire length of the screw. Then the portion for the screw body is drilled 0.02-in. smaller than its diameter. In this way, it is possible for the screw to enter the hole evenly without going too far or without breaking and tearing the wood, thus assuring a perfect seat in the hardened plate.

The rapping plate shown in Fig. 5 is rather complicated and expensive. It gives good service, however, even at high production rates, and is recommended for large patterns used on long production runs. The plate is fastened with machine screws welded to a counterplate. A tube is welded to the flange to lengthen the bore of the shaft. Thus the entire installation gets an exceptionally good hold in the pattern. For this installation to be effective, a strong, rigid pattern construction must be used which distributes the hard blows during rapping over the entire body of the pattern. In that way a concentration in the area of the rapping plate will be avoided.

To lift heavy and cumbersome patterns from

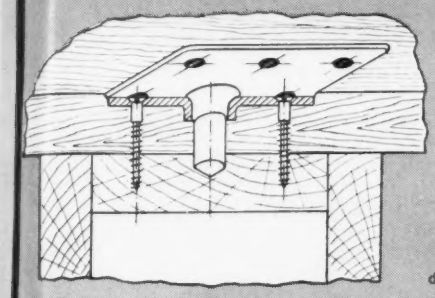


Fig. 3 — Rapping plate for heavy and large patterns

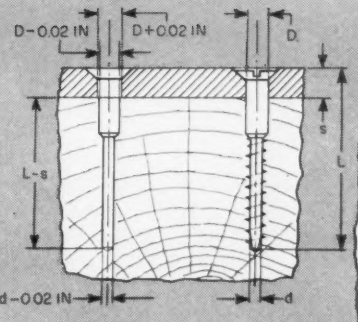


Fig. 4—Diagram shows how to drill for wood screws

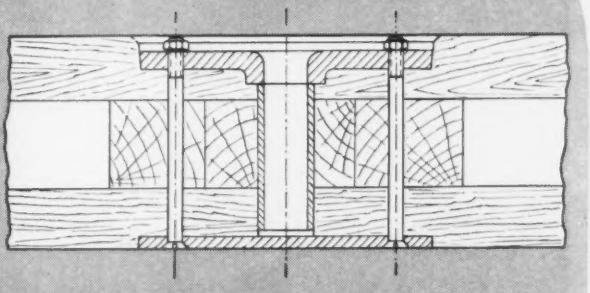


Fig. 5—Rapping device made with counterplate

WEAR

the bottom board, metal straps or bands invariably are used because they offer a practical and simple means of securing lifting hooks. Fig. 6 illustrates how these straps may be used either inside or outside the pattern. They should be installed so that they are slightly below the parting line and so that the pattern can rest on the bottom board during the molding process. Either wood or machine screws may be used to fasten these straps. For easy insertion of the hook, a half-round or semicircular depression must be made in the pattern. Provisionally screwed-on lift-out straps on the exterior walls of a pattern are in any case only temporary measures and should be avoided since they often damage the mold cavity during lift-out and require time-consuming repairs.

Fig. 7 shows several types of hanger straps recommended for crane transportation of heavy patterns and core boxes. They permit rapid and sure handling and provide a means of fastening to the mold to prevent movement. In this way, damage through use of chains or heavy ropes can be avoided.

There is a difference between the hanger plate and the hanger eye. The hanger eye is made of iron and is fastened to the exterior of the pattern. The eye of the hook extends beyond the pattern surface. This construction is used principally where large surfaces or core stock are at one's disposal, since unavoidable damage does occur, and where repairs can be made to the patterns without great difficulty. The hanger plate is either rectangular or round, with a threaded hole for screwing in the eye bolt. This part is mounted flush with the outer surface of the pattern so that the shape is not changed to any great degree by its addition. Hence the hanger plate is especially suited for those patterns which have irregular shape.

Fig. 8 shows how to construct and mount an offset iron strap on the side wall of a corebox.

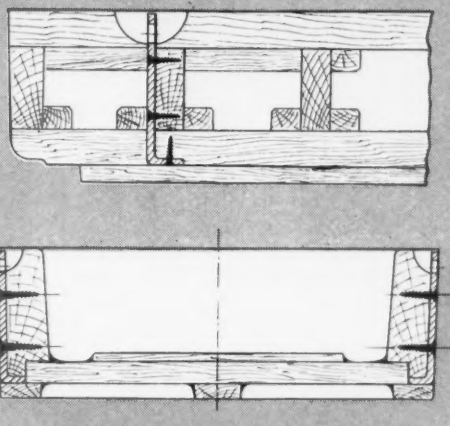


Fig. 6—Lifting straps, interior and exterior

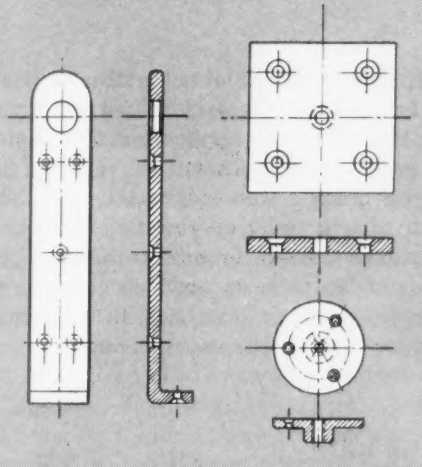


Fig. 7—Hanger straps used with heavy pieces

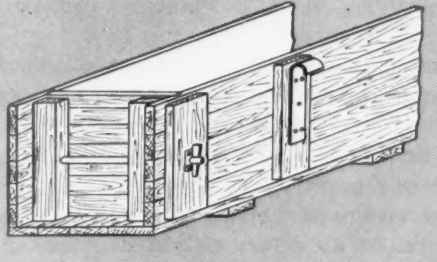


Fig. 8—Offset iron strap on wall of corebox

Brass Foundry Alloys

Last month, Mr. St. John began his discussion of compositions and applications of brass foundry alloys by covering high-strength, yellow and semi-red alloys. This article, ninth in his series on The Brass Foundry, takes up red brasses and bronzes

By HARRY ST. JOHN
Foundry Consultant

IN A PRECEDING article (March, 1956) brass foundry alloys were classified both as to composition and as to application. The high-strength brasses (manganese bronze), yellow brasses and semi-red brasses were described. As the percentage of zinc is reduced further, we find that the red brasses and the bronzes containing 10 per cent or less of tin have so much in common that they may very well be classified in the same group. They are among the most commonly used of all brass-foundry alloys.

Alloy	8	9	10
Copper, per cent	85.00	88.00	88.00
Tin, per cent	5.00	6.00	8.00
Lead, per cent	5.00	2.00	0.30 max.
Zinc, per cent	5.00	4.00	4.00
Nickel, max. per cent	1.00	1.00	1.00
Tensile strength, min. psi	30,000	34,000	40,000
Yield strength, min. psi	14,000	16,000	18,000
Elongation, min. per cent	20	22	20
ASTM Alloy No.	B145(4A)	B143(2A)	B143(1B)

Numerous similar alloys are in use, having proportions which vary quite a bit from those shown, but any composition having less than 4.0 per cent tin or more than 6.0 per cent lead hardly belongs in this group. Variations are due to a preference on the part of the foundryman or his customer, or to an effort to reduce cost or improve machinability, without much effect on other properties. In practice the physical properties of the alloys listed are often much better than those shown in the table. For example, in the case of Alloy 9, a tensile strength of 50,000 psi, accompanied by an elongation of 40 per cent, is not unusual.

Silicon, aluminum and magnesium affect the structure of these alloys vary unfavorably, evidenced by a coarse, discolored fracture. Not more than a trace of any of these can be tolerated. According to specification, sulphur up to 0.08 per cent is permissible in Alloy 8, 0.05 per cent in Alloys 9 or 10. If sulphur can be limited to considerably lower values, a possible source of trouble will be avoided. Phosphorus should not exceed 0.05 per cent, iron 0.15 per cent, antimony 0.25 per cent. As in other alloys described previously, 1 or 2 per cent of nickel markedly refines the grain.

In these alloys we are still dealing with the alpha solid solution of zinc and tin in copper. Tin by itself is soluble in copper up to about 16 per cent, but in the presence of zinc, when tin exceeds about 5 per cent, a new phase appears. In slowly cooling heavy sections, tin has a tendency to concentrate in the last metal to solidify and this begins to show the tin rich complex of tin and copper known to the metallurgist as the alpha-delta eutectoid. Under the microscope this is apparent

In the brass foundry at Crane Co.'s Chicago Works, most red metal is melted in electric arc furnaces. Capacities range from 250 to 1000 lb

as tiny light-colored particles scattered through the matrix. These particles are very hard and materially increase the strength of what would otherwise be the weaker sections of the casting. As the proportion of tin in the alloy increases, the proportion of the delta constituent increases also.

Alloy 8, commonly known as ounce metal or 85-5-5-5 is a general purpose alloy which has long been a favorite. It is largely used for medium pressure valves and fittings and for high-grade plumbing fixtures. Alloy 9, often referred to as Navy M, is one of the best alloys for high-pressure valves. It can be used at temperatures up to 550° F. Alloy 10 is the modern Navy G, having largely replaced traditional gun metal, 88 copper, 10 tin, 2 zinc. Its resistance to sea water is good, making it suitable for marine engine parts. One of its principal uses is for heavy-duty, slow-speed bearings. It is also used for high-pressure valves.

The foundry behavior of these alloys, particularly Alloy 9, is good, although all are critical as to pouring temperature. Their solidification shrinkage is relatively small; gates and risers can be held to a minimum. Alloy 8 is the cheapest and by far the most machinable of the three. Its principal disadvantage is a tendency to gas porosity if melting conditions and pouring temperatures are not controlled carefully.

Where specifications permit, alloys of superior properties can be obtained by the addition of substantial percentages of nickel. For example, in Alloy 8, if 5.0 per cent of nickel replaces a like amount of copper, the minimum tensile strength is increased to 40,000 psi, and the yield strength to 20,000 psi, with no loss of elongation. This metal is so uniformly fine grained and dense as to be impervious to the penetration of refrigeration gases, making it possible to substitute castings for forgings in certain applications.

Bearing Bronzes—In this group are included the phosphor bronzes, of which there is a considerable variety, ranging in phosphorus content from 0.20 to 1.00 per cent. In the absence of lead they are very hard and long wearing, suitable for gear-blank castings which are often chill cast to give a harder wearing surface. The tin may run as high as 20 per cent in which case the elongation drops to about 2.0 per cent and the yield strength almost equals the tensile.

Among the bearing bronzes a traditional favorite is 80 per cent copper, 10 tin, 10 lead. The combination of a hard matrix with the soft lead inclusions facilitates lubrication and makes the alloy suitable for bearings of higher speed. For railroad cars and locomotives a bearing sometimes used has a steel back lined with 77 per cent copper, 7 tin

and 16 lead. The variety of bearing alloys is very great; each seems to have distinctive properties which recommend it to its user. One extreme is an alloy used for packing rings, containing 60 per cent copper, 40 lead, or even 50 per cent copper, 50 lead, which it seems logical to mention here, even though it can scarcely be classified as a bronze, or even as an alloy. This, by the way, is an extremely difficult mixture to handle since lead is much heavier than copper and does not dissolve to any great extent. Vigorous stirring when the metal is ready to pour is essential. Plunging stick sulphur into the molten mixture is sometimes done to help hold the lead in suspension.

Miscellaneous Tin Bronzes—For resistance to acid corrosion, such as in mine waters, true bronzes like 90 per cent copper, 10 tin or 95 per cent copper, 5 tin are often used for valves and fittings.

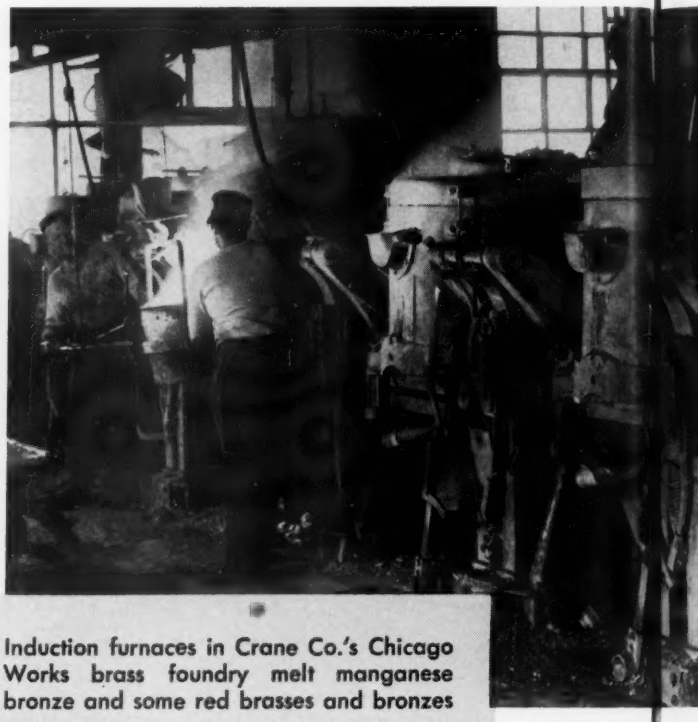
For architectural work, doors, statues, tables and the like a typical alloy would be 90 per cent copper, 5 tin and 5 zinc, although the tin and zinc may vary considerably either above or below 5.0 per cent. Molding, gating and pouring to achieve the desired intricacy and perfection of surface constitute more of a problem than does the composition of the metal used. The principal requirement is that the casting must stand weathering and develop an attractive patina.

For bells the tonal requirement makes necessary a hard brittle bronze. If it doesn't crack in the making or in use the foundryman breathes a sigh of relief. Eighty per cent copper, 20 per cent tin is a typical alloy.

Copper Castings—For electrical fittings the high conductivity of copper is an important consideration. Pure copper is difficult to cast because of its habit of setting free large volumes of gas during solidification. Small additions of deoxidants such as phosphorus and silicon will overcome this condition but they seriously reduce the electrical conductivity. For example, otherwise pure copper containing 0.20 per cent phosphorus will make sound castings having a conductivity less than 20 per cent that of standard wrought copper. It is necessary to use a deoxidizer which will not remain in solid solution in the copper. High-conductivity copper castings should have a purity of 99.85 except for certain special compositions which will be mentioned a little later. The minimum electrical conductivity should be 80 per cent of standard.

For the successful production of pure copper castings the purest copper obtainable should be melted under an atmosphere as nearly stagnant as possible, free from water vapor and uncombined oxygen. After superheating to a temperature of not less than 2300° F, a deoxidant such as calcium boride (about 4 oz per 100 lb) or boron carbide, is plunged into the melt and stirred vigorously. Addition of 0.02 per cent lithium metal also will produce copper with high conductivity.

To a considerable extent the use of pure copper castings has been supplanted by high-copper alloys which can be hardened by heat treatment. Chromium, beryllium, cobalt, nickel and silicon, in closely controlled combinations, are effective alloying elements. These alloys are much less troublesome to cast than is pure copper. The castings combine increased strength with high conductivity. As they come from the sand their properties are not remarkable but, gradually, as time goes by, their character changes due to the combination of the alloying elements with each other. A new phase appears in the form of minute particles finely dispersed throughout the copper matrix, greatly strengthening and hardening the casting and at the same time permitting the conductivity to rise.



Induction furnaces in Crane Co.'s Chicago Works brass foundry melt manganese bronze and some red brasses and bronzes

In practice, heat treatment takes the place of the slow aging process, producing results much more rapidly and effectively. Varying somewhat according to which alloying elements are used, the castings, after cooling in the sand, are heated to about 1650° F for an hour or more, then quenched to room temperature and again heated to about 950° F for three or four hours. This sequence of operations is commonly called precipitation hardening.

For highest conductivity 0.80 per cent of chromium, combined with 0.08 per cent silicon in otherwise pure copper can be made to yield a conductivity of 85 per cent with strength and hardness considerably above that of pure copper alone. Nickel or cobalt similarly combine with silicon to produce even higher strengths although lower conductivities. A combination of 2.60 per cent cobalt with 0.40 per cent beryllium can result in a strength of 90,000 psi and a brinell hardness of 220, accompanied by a fairly respectable conductivity of 45 per cent. When conductivity is not

of prime importance, remarkable physical properties are reported for some of the beryllium alloys, as witness the following:

Tensile strength, 180,000 psi; yield strength, 115,000 psi; elongation, 3 per cent; brinell hardness, 425; electrical conductivity, 20 per cent. This is an alloy of 97 per cent copper, 2.50 per cent beryllium and 0.50 per cent cobalt.

In these and other precipitation hardening alloys the added elements must be present in just the right proportions, and the presence of impurities may be critical.

Alloys in this group are expensive but their combination of favorable electrical properties, strength, resistance to wear, erosion and corrosion gives them a place where service conditions are extreme. An important if somewhat limited application is for nonsparking hand tools in oil refineries and other places where the danger of explosive atmospheres exists.

Copper-Base Silicon Alloys—Silicon plays a peculiar role in its relation to the copper-base alloys. It reacts badly in the presence of lead, forming a drossy lead silicide which inevitably affects both the appearance and pressure tightness of castings. Even more serious is the fact that, in the red brasses and bronzes, quantities of silicon too minute to cause much trouble with lead result in a coarse dendritic structure so that the castings not only have a bad appearance but are very lacking in strength and pressure tightness. However, there is reason to believe that the effect of silicon on crystal structure occurs only when tin and zinc are both present in the alloy and not even then when the percentage of tin is small compared with the amount of zinc present. At any rate, silicon is an important element in a useful group of copper-base alloys, some of which contain zinc, some tin, but seldom both together.

The best alloys in this group all contain approximately 4.0 per cent silicon with one additional alloying element, which may be zinc, tin, iron or manganese. Typical compositions and properties are shown below.

Alloy	11	12	13	14
Copper, per cent	82.00	95.00	95.00	94.50
Silicon, per cent	4.00	4.00	4.00	4.00
Tin, per cent	....	1.00	....	....
Lead, max. per cent	1.00	0.50	0.50	0.50
Zinc, per cent	14.00	....	....	....
Manganese, per cent	....	....	1.00	....
Iron, per cent	....	....	....	1.50
Tensile strength, psi	60,000	50,000	50,000	50,000
Yield strength, psi	25,000	20,000	20,000	24,000
Elongation, per cent	20	22	22	15
ASTM Alloy No.	B198(13A)			

The silicon is partially soluble in the copper matrix but further combines with the second alloying element to form a silicide. This precipitates out (like some of the high-copper alloys discussed previously) in dispersed fine particles. These give the alloys their enchanced physical properties. Precipitation takes place without the necessity of a heat treatment.

The silicon brasses and bronzes offer no great difficulty in the foundry although they may be a bit troublesome at first to the foundryman who is not accustomed to their use. In solidification shrinkage the silicon alloys are midway between manganese bronze and the red brasses and bronzes and thus need smaller gates and risers than do the high-zinc alloys. They are critical as to pouring temperatures, which range 100° F to 200° F lower than for the red metals. It is important not to overheat the metal in the furnace. The foundry and the machine shop must use extreme care to keep foundry returns and machine turnings separate from other alloys in order to avoid silicon contamination of the red metals.

The silicon brasses and bronzes have exceptionally good corrosion-resisting properties and are superior in this respect to most if not all of the other copper-base alloys. They can be used for valve bodies and fittings, where pressure tightness is an essential, as well as for valve stems and trim. In cases where only moderate strength is required (50,000 psi tensile) and manganese bronze encounters corrosion difficulties, the silicon alloys can be used to advantage. Their versatility is illustrated by the fact that they can also be substituted for the tin bronzes in the manufacture of bearings, ornamental work and bells. They give excellent service in marine work and in mine waters. Their principal disadvantage is cost. Incidentally, the foundryman should not attempt to make these alloys himself but rather should use ingot furnished by an authorized smelter.

Two important alloying elements remain to be discussed—aluminum and nickel. The next article will cover these and will also summarize the qualities of the different alloy groups to show how best a particular alloy can be selected for a specific application.

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Synthetic Sands

for the Nonferrous Foundry

Operation of a synthetic sand system in a nonferrous foundry requires attention to fundamentals. The authors discuss the selection and testing of clays, and analyze the influence of sand and other factors on casting defects. This paper was presented before the 1955 Ohio Regional Foundry Conference

TABLE I — Analysis of Typical 4-Screen Bank Sand

(AFS No. 100)

SIEVE	% RETAINED
10	—
20	—
30	.10
40	.10
50	.80
70	11.60
100	37.40
140	27.40
200	12.80
270	4.80
Pan	3.80
AFS Clay	1.20

MANY nonferrous foundrymen have sought more information on the nature, quality and purpose of additives commonly used in synthetic sands. In addition to discussing these points, the authors will analyze some casting defects and attempt to point out the influence on them of other factors than sand.

The Four-Screen Sand — Since this paper will deal in terms of the popular and successful four-screen sand[1], it may be wise to review briefly the basic concepts of this type of synthetic sand. The first and perhaps foremost prerequisite is the distribution of the sand grains themselves. Table I shows a typical screen analysis of bank sand which has given satisfactory results. Note that on a clay-free basis, the following base pattern is obtained on the four adjacent major screens:

On the 50 sieve—3.5 per cent maximum; 70 sieve —10-15 per cent; 100 sieve—25-35 per cent; 140 sieve—25-35 per cent; 200 sieve—10-15 per cent

Before selecting the base sand or sands, the foundryman should consult with his sand supplier regarding availability, base cost shipping points and guaranteed analysis limitations. Keep in mind that the next coarser sieve immediately above the four-screen group must be controlled to a 3.5 per cent maximum, or casting finish will become rough. When this value exceeds 3.5 per cent, there usually is practically no positive action for compensation that will produce smooth finish. The only solution is to eliminate the coarse grains of sand.

The sand grains usually are bonded with southern bentonite, although western bentonite or fireclay has been used on occasions.

Experience has proved that a stabilizer is needed in nonferrous synthetic sands as much as in ferrous synthetic sands. Most operators find that the stabilizer is not an "aspirin" tablet, as they once believed, but is necessary to attain the flexibility never possible under their old sand practice. Many types of stabilizers are available today, the cellulose variety being the most popular in the nonferrous field. The partially carbonized cellulose has, in addition to the stabilizing quality, the extra feature of developing extremely high flowability in the sand.

A formula which usually works well in starting a new synthetic sand calls for 6 per cent southern bentonite and 2 per cent stabilizer. Moisture runs 3 to 3.5 per cent. After the first heat, these additives should be cut back to about 0.5 per cent southern bentonite and 0.25 per cent stabilizer. Moisture content eventually will level off at 3.8-4.2 per cent for machine molding and 4.2-4.6 per cent for loose pattern work. Nonferrous foundries are successfully casting in the range of several ounces up to 1 ton using this type of sand practice, and molds are poured in green sand. As the casting weight is increased, it may be necessary to run clay and total combustible content at slightly higher levels.

Clay Addition for a Synthetic Sand—Generally, the foundryman may select from three clay types, western bentonite, southern bentonite and fireclay. Bond is used in the sand mix primarily to render a cohesive force in the matrix that will hold the sand grains in a fixed position after ramming and maintain this position throughout pouring.

Failure to do so results in dirt inclusions in the casting. Clay also has some effect in suppressing expansion defects because of its high shrinkage factor.

Selecting the Proper Clay—One of the first considerations should be the ability of these clays to develop green compression strength. Fig. 1 shows green compression curves developed by the 1-10 ram test on mixes containing, respectively, (on a by-weight basis), 6 per cent southern bentonite, 6 per cent western bentonite and 6 per cent fireclay. The base sand in each case consisted of 60 parts lake sand and 40 parts bank sand. Moisture content was 3.2 per cent. From the curves, one can see that if fire clay is used, an amount in excess of 6 per cent by weight will be required to develop adequate working green strength. Successful results have been achieved by using 10 per cent of fireclay by weight when a new synthetic sand is started.

Southern bentonite most commonly is chosen for the clay additive because it is possible to operate these high green strengths—strengths necessary to stop dirt inclusions from cutting or washing, erosion scabs and swells—yet to cause no serious loss of flowability.

If dry or hot strength requirements are critical, southern bentonite will have to be augmented with either western bentonite or fireclay; southern bentonite develops lower dry and hot strength than either of the two other types of clay. For specific comparisons of dry and hot strength values between these three clays, refer to the literature on the subject.

Western bentonite seems to be the better choice for systems that run extremely hot sand—120° F and higher. Apparently, southern bentonite and fireclay deform less than western bentonite, and the excessive heat causes southern bentonite and fireclay to become extremely brittle. The end result frequently is that side walls dust off and sharp edges break or crumble easily. In a synthetic sand to be used primarily for hand ramming of loose pattern equipment, fireclay often is used. Since a larger volume of this type of clay is required to produce a working green strength, there is a greater mass of clay to assist in retaining moisture, somewhat as in natural bonded sands. This feature is necessary where molds lay open with exposed surface area while broken corners are patched and sprues, runner and gates are cut.

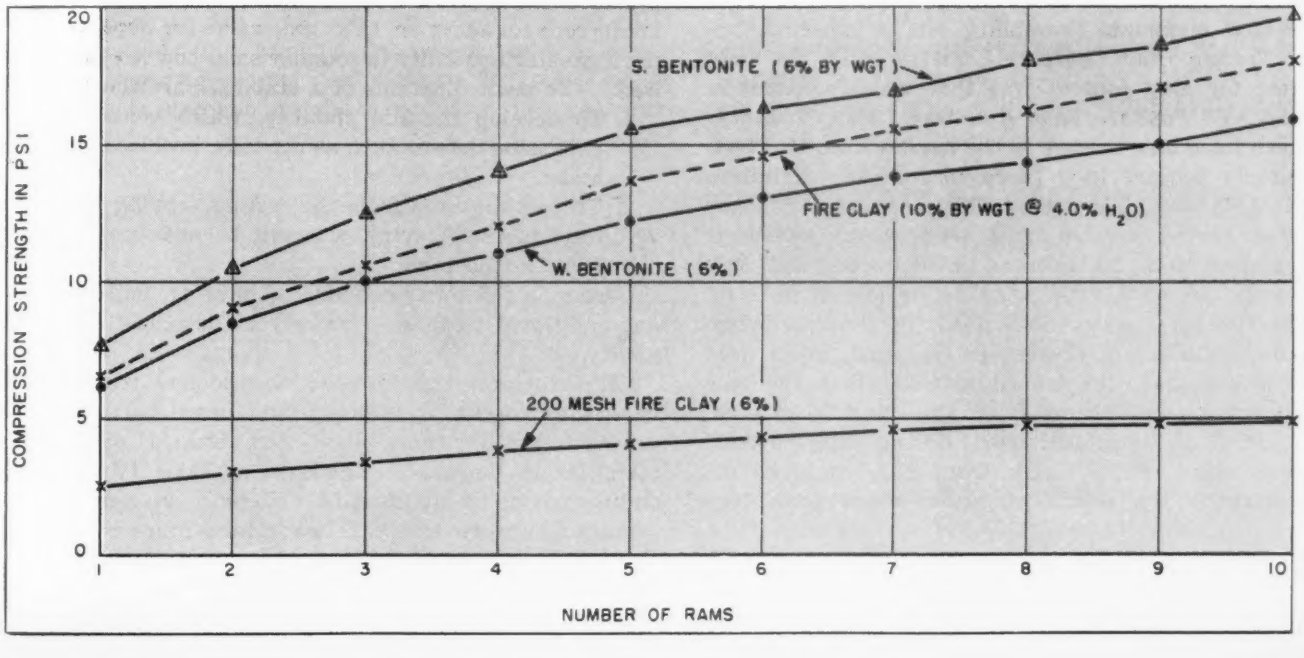
Testing Clay Activity or Strength—Numerous tests are used by the foundry industry to determine the activity of clay in sand. These tests measure activity from room temperature up to and including 2500° F. They include the following

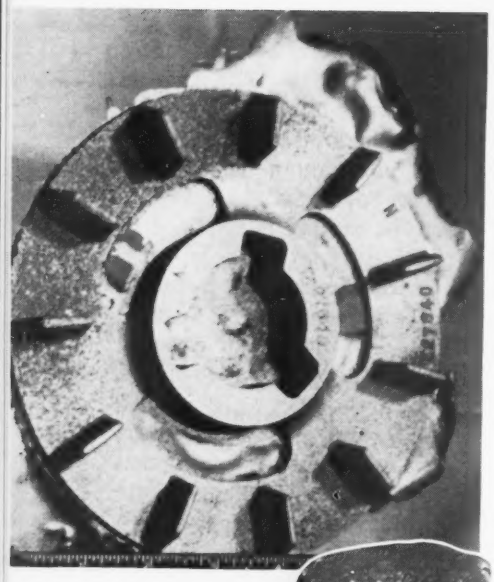
1. Green strength—loaded under compression, tension or shear.
2. Air set strength—usually loaded under compression.
3. Dry strength—loaded under compression, tension or shear.
4. Hot strength—usually loaded under compression.

The most common test is, of course, the green compression test. Since a compression test at the three-ram level may be misleading, because of insufficient information, the 1-10 ram series (developed by William Moore, Meehanite Corp. See AFS *Transactions*, 1950) has been incorporated in the control of four-screen synthetic sands.

Experience has proved that such defects as cuts, washes, etc., virtually can be eliminated in nonferrous founding when green compression strengths developed at the 10-ram level are a minimum of 25-30 psi. A typical 1-10 ram test is illustrated in

Fig. 1—Chart shows green compression strengths with western bentonite, southern bentonite and fireclay. The sand mix contains 60 parts lake sand, 40 parts bank sand, 6% clay and 3.2% water





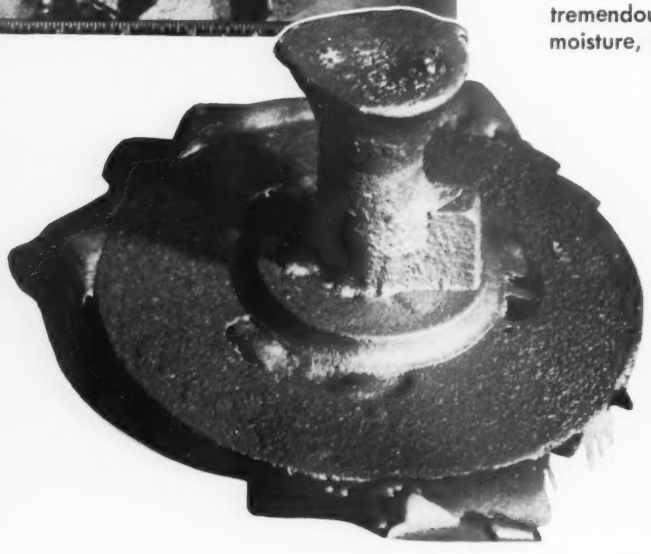


TABLE II—Typical 1-10 Ram Test Data

Rams	Green Perm.	Green Comp.	Mold Hardness	Wgt.
1	82	9.9	83	144
2	62	14.0	88	151
3	48	17.4	92	155.5
4	43	20.5	92	158
5	40	23.2	93	160
6	37	26.0	94	161.5
7	35	28.5	95	163
8	32	29.3	95	164
9	30	31.4	95	164.8
10	29	32.8	95	165.5

Moisture 4.6% Dry Compression 71.3 psi

Figs. 2 and 3—Two views of metal penetration on an aluminum fan blade. The heavy fin would lead one to believe mistakenly that tremendous pressure existed inside the mold because of excessive moisture, high total combustible content or a combination of both

Table II. These data also indicate the degree of flowability in the sand. Rate of increase in mold hardness should be quite rapid and show an ultimate hardness value of 95 or 96 by the tenth ram if maximum flowability can be expected.

Testing Clay Content—Until recently, the only test for clay content was that which appears in the AFS *Foundry Sand Handbook*. Many foundrymen have been misled by the results from this test, simply because they failed to read the definition of AFS clay. The term "AFS clay" merely means that earthy portion of a sand sample which is smaller than 20 microns in diameter and will settle out at a rate equal to or less than 1 in. per minute when suspended in water. When combustibles are present in the sand, as in used molding sand, the test does not reflect the true clay content. Therefore, if the quantity of combustible material removed during the physical separation of AFS clay from SiO_2 could be determined, the result would be closer to a true clay value.

In the procedure outlined by J. S. Schumacher[2], the total combustible content is determined for a given sand sample, as received from the foundry (TC_1), as well as on the sample after AFS clay separation and sieve analysis (TC_2). The difference represents the quantity of the total combustibles washed from the sand with the clay. This loss, in per cent, is subtracted from the per cent AFS clay content and the result referred to as true clay. The formula is this:

$$\% \text{ True Clay} = \% \text{ AFS Clay} - (TC_1 - TC_2)$$

This procedure would seem to be substantiated by the correlation with the Bouyoucos test generally conceded to be the most accurate method known for measuring clay content in foundry sands. Table III shows laboratory data for both true clay and clay by Bouyoucos methods. Note that the values obtained are identical. Similar tests run on other sands gave the same comparisons.

Combustible or Stabilizer Addition—Even though carbon-type stabilizing materials have been looked upon in the past with a degree of suspicion by some nonferrous foundrymen, their true value for imparting a greater flexibility to foundry sand now is realized. The main functions of a stabilizer are these:

1. To develop thermal stability, which controls expansion defects such as rat-tails, buckles and scabs.
2. To peel the sand from the casting, leaving the sand in the foundry, where it belongs, not in the cleaning room.

Certain stabilizers, in addition, have an important additional feature — namely to develop flowability.

On occasions, the inability to produce tensile bars with correct metallurgy, and hence to meet physical specifications, has been blamed on a stabilizer in the sand. The data in Table IV definitely show no appreciable difference in tensile strength between test bars made in a four-screen synthetic sand containing, respectively 0, 2 and 5 per cent stabilizer. Sands used were new mixes made up from a bank sand, with an AFS number

TABLE III—Methods of Determining Clay Content of Foundry Sand

AFS CLAY AND SCREEN ANALYSIS		TRUE CLAY CALCULATION		CLAY BY BOUYOUCOS METHOD
Sieve	% Retained	—Combustible Content—		
		Before Washing	After Washing	
10	——			40 sec @ 65°F =4.0
20	.55	9.85 = Tc_1	7.50 = Tc_2	—.2 per °F under 67°F = .4
30	1.54			3.6
40	10.27	True Clay = AFS Clay—(Tc_1—Tc_2)		3.6 x 100 = 7.2% Clay + Silt
50	28.99	=6.73—(9.85—7.50)		50
70	32.22	=6.73—2.35		1 hour @ 66°F =2.4
				—.2 per °F under 67°F = .2
100	13.26			
140	3.27	True Clay = 4.38%		2.2
200	1.34			2.2 x 100 = 4.4% Clay
				50
270	.77			7.2 — 4.4 = 2.8% Silt
Pan	1.02			
AFS Clay	6.73			

100 as the base sand, and Table IV shows the green sand properties of the test molds. Two molds were made from each mix, and all six molds were poured from the same heat with a temperature drop of less than 100°F from the first mold through the sixth mold.

Like any other material added to sand, the amount of stabilizer should be measured judiciously. Using more than is necessary will require higher than normal moisture content; it will discolor the casting appreciably, produce a smoky shop during pour-off and, of course, increase the cost of the sand mix. The accepted method for controlling the stabilizer addition is to run a total combustible test on the sand at least two or three times each week. It is suggested that this test be run in accordance with the ASTM procedure for the proximate analysis of coal, thereby providing the ratio of volatile matter to fixed carbon. The sum of these two numbers is total combustibles. Typical test data would be: volatile matter 4.30 per cent; ash 95.35 per cent; fixed carbon 0.35 per cent; total combustibles 4.65 per cent.

Improper Gating and Casting Defects—One of the most common defects caused by improper gating is the expansion scab or buckle. Even though either defect in many instances is caused by slow pouring, foundrymen will go through an elaborate series of sand mix changes to eliminate the scab or buckle. Often he is rewarded by little or no success, although the defect could have been eliminated merely by faster pouring.

The authors acknowledge that certain copper-base alloys do not lend themselves favorably to fast pouring, due to froth formation from turbulence. The excellent work accomplished recently by the gating research sponsored by AFS has shown, however that careful gating design virtually can eliminate turbulence. Knowing how to control turbulence, we should be able to pour faster when necessary and at the same time produce castings free of defects caused by frothing.

Figs. 2 and 3 are two views of a beautiful case of metal penetration on an aluminum fan blade. Notice the heavy fin. This fin would lead us to suspect that tremendous pressure existed inside the mold that could have been caused by excessive moisture or high total combustible content or both. Apparently, neither had any effect since the casting shown by Figs. 4 and 5 was made in the same

TABLE IV—Sand Properties of Test Molds and Properties of Test Bars

Test No.	Moist.	Perm.	Mold Hardness	Green Strength	Remarks	Tensile Strength	Elongation
1A	4.6	53	85.0	8.2	No stabilizer	31,800 psi	14.5%
B	——	——	——	——	"	30,800	14.0
C	4.5	53	84.0	8.2	"	29,000	12.5
D	——	——	——	——	"	29,700	12.5
2A	4.5	48	86.0	10.3	2% stabilizer	33,500	12.5
B	——	——	——	——	"	34,000	12.5
C	4.5	48	88.0	10.3	"	34,000	15.6
D	——	——	——	——	"	misrun	——
3A	4.4	42	87.0	10.2	5% stabilizer	34,250	15.6
B	——	——	——	——	"	34,000	14.0
C	4.4	42	——	10.6	"	35,200	12.5
D	——	——	——	——	"	38,500	17.2
					Pouring Temperature 2050° F—1950° F		

sand, by the same molder, on the same molding machine and rammed to identical mold hardness. Both molds were poured consecutively from the same ladle. A temperature difference of less than 25°F existed between the good and bad casting. The poor gating arrangement must then, by deduction, be the cause for the severe penetration seen on the defective casting.

Occasional Contributors to Sand Problems

Contamination by Core Dilution—This phrase refers to the physical collapse of the cores within or around a casting which causes them to remain in the molding sand after removal of the casting. Without a doubt, contamination by core dilution was chiefly responsible for old natural sand heaps going "dead." Even today, the influx of new sand from collapsed cores often is either overlooked completely or grossly underestimated. In either case, the foundryman is confronted periodically with high scrap loss due to dirty castings. If the situation is severe enough, he may also have an epidemic of cope drops. As the quantity of core sand dilution reaches a certain point, the normal clay addition to each mix no longer can accommodate the volume of clay-free core sand, and green strengths thereafter fall off rapidly. In such a spot, a good sand control program really can pay off. Plotting the daily test results on a chart will give visual evidence of when such point has been reached in a sand system, and something can be done before trouble really hits.

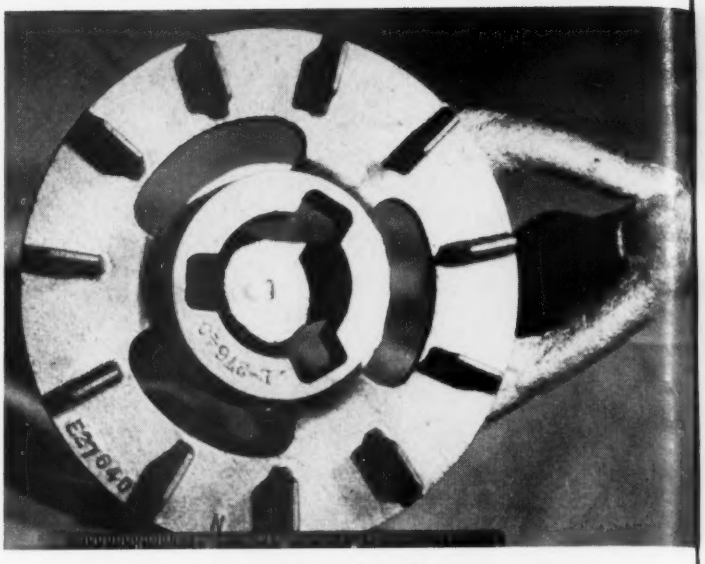
Yet, core dilution is the most economical way of maintaining a working volume of sand, keeping the permeability up and maintaining the feel of life in the sand. To take advantage of this economy requires planning. First, identical or very similar base sands should be used in both the coreroom and the foundry. Remember: *"Today's core sand will be tomorrow's molding sand."* Should a coarser sand be used in the coreroom, it will not take long for coarse grains to show up in the molding sand, and casting finish then becomes rough. Likewise, should a finer sand be used in the coreroom, then a buildup of fines will occur in the molding sand. The possibility of either is reason enough why a sieve analysis should be run on the molding sand at least once a week.

The second step for controlling the results of core dilution is to estimate the daily influx or core sand into the molding sand and to make extra additions of clay accordingly. This estimation may require several revisions before results are satisfactory.

A third step which should be considered is to take the sand from floors where core work is heavy and rotate it, after reconditioning in the muller, with sand from floors where core work is light. This step averages out the new sand throughout the entire system.

Experience has proved that unless these three basic steps are followed, the economy and other favorable features of core dilution cannot be realized and severe scrap problems will result.

Incorrect Core Dimensions—Difficulties arising from oversized cores may sound elementary and should never be found in foundries. Nevertheless, it is surprising how often dirt results from a crush caused by jamming a core too large for its respective print in the mold cavity. This condition can be caused by the core's sagging out of shape prior to baking; or the corebox and the print on the pattern may have been mismatched originally. Regardless of how obtained, it is possible for the oversized core to work satisfactorily if the molds are soft rammed. If close tolerances are to be a salable feature of castings, however, hard ramming is a must. In this case, the molds will no longer have the sponginess that permits an oversized core to be squeezed into too small a print. One case is recalled where a core was oversized to such an extent that during the first day's operation with synthetic sand, the cope was unable to close tightly on the drag and numerous runouts were encountered.



Figs. 4 and 5—Good casting shows how poor gating caused penetration in casting in Figs. 2 and 3, for it was made identically and poured consecutively, from the same ladle of metal. Fig. 5, on next page, shows reverse side of casting

Another common difficulty is shifted cores. It usually is caused by pasted joints that are jarred by rough handling. The drag half will fit into its print, but a shift at the core joint will prevent the other half of the core from fitting into the cope print. Consequently, a crush occurs and dirt dropping in the mold cavity ends up in the casting.

In production shops where a large number of cores are blown from one set of boxes, appreciable wear occurs adjacent to blowholes and vents. This wear produces cores that are fatter in places than desired and may cause distorted or cracked cores during drying.

Warped core plates sometimes produce bowed parting lines at the pasted joints. Unless the pattern print is large enough to compensate for the additional core dimension at the print ends resulting from the bowed parting line, a crush will result.

Hot Molding Sand—Hot sands include those reaching the molding stations at above 120°F. The usual disadvantage associated with hot sand is brittleness or hot shortness. Because of the rapid drying out due to evaporation, mold walls dust off and sharp edges break easily. In extreme cases, hot sand feels more like a handful of hot, wet ashes. When temperatures are 120°F at the molding stations, they will be at least 20-30 degrees higher at the muller. Temperatures at this level prevent the muller operator from accurately judging the moisture content in the sand. Consequently, moisture content is apt to be erratic. With dry sand, we can expect dirty castings and bitter comments from the molders. Wet sand produces soft rammed molds, swelled and oversized castings, rough casting finish and, occasionally, scabs.

The best way to combat the hot sand problem is to dissipate the heat. Mullers can be equipped with cooling fans. In many installations, a blower fan drives a stream of air upward through the sand as it is mulled, discharging to the atmosphere above the roof; or the exhaust air can be taken away by means of a suction fan integrated with the dust collection system. This method cools incoming sand at 250-300°F to within a few degrees of room temperature or the inlet temperature of the fan.

Incorporating water fogging nozzles along the shakeout return belts further assists in lowering the temperature. The fogging nozzles usually are hooked up with a solenoid type water valve activated by a mercury switch, which in turn is controlled by a steel strap "ski" that rides on top of the sand on the belt. As sand travels at intermittent intervals on the belts, the "ski" raises or lowers and controls the water flow into the fogging nozzles only when sand is on the belts. Stub plows arranged on alternate sides of the belt at 3-ft intervals expose unwetted portions of sand and promote the efficiency of the fogging nozzles. Only enough water is introduced in this manner to be evaporated off by the heat in the sand. We still wish to do the tempering of the sand in the muller.

If cooling by either or both of the above methods is not available, several expedients are possible, although they are not nearly as effective. Western bentonite is considered the preferred bonding clay for hot sands. Also, judicious use (0.1 per cent or less by weight) of wheat, cereal or corn flour will help to reduce brittleness in the sand. Wheat flour has a distinct advantage in this respect in that a buildup of this material in the sand does not reduce the flowability so drastically as the others. A few foundrymen advocate the addition of 0.5 to 1.0 per cent diethylene glycol to hot sand systems. After the first complete cycle, the same percentage is added only for the new sand entering the system. They further suggest that moisture content be reduced by 0.5 per cent.

The authors will admit readily that this paper contains little radically new to the men devoting their daily thoughts and efforts to synthetic sand. Nevertheless, many so-called sand defects may be corrected with greater ease and frequency if the foundryman can take the same old basic set of rules and try a new and different application. That statement means just this — was the scab caused by poor gating and slow pouring? If it was, make necessary corrections. If sand was responsible, alter the sand. Once you succeed in determining the true source of trouble, the solution follows quickly.

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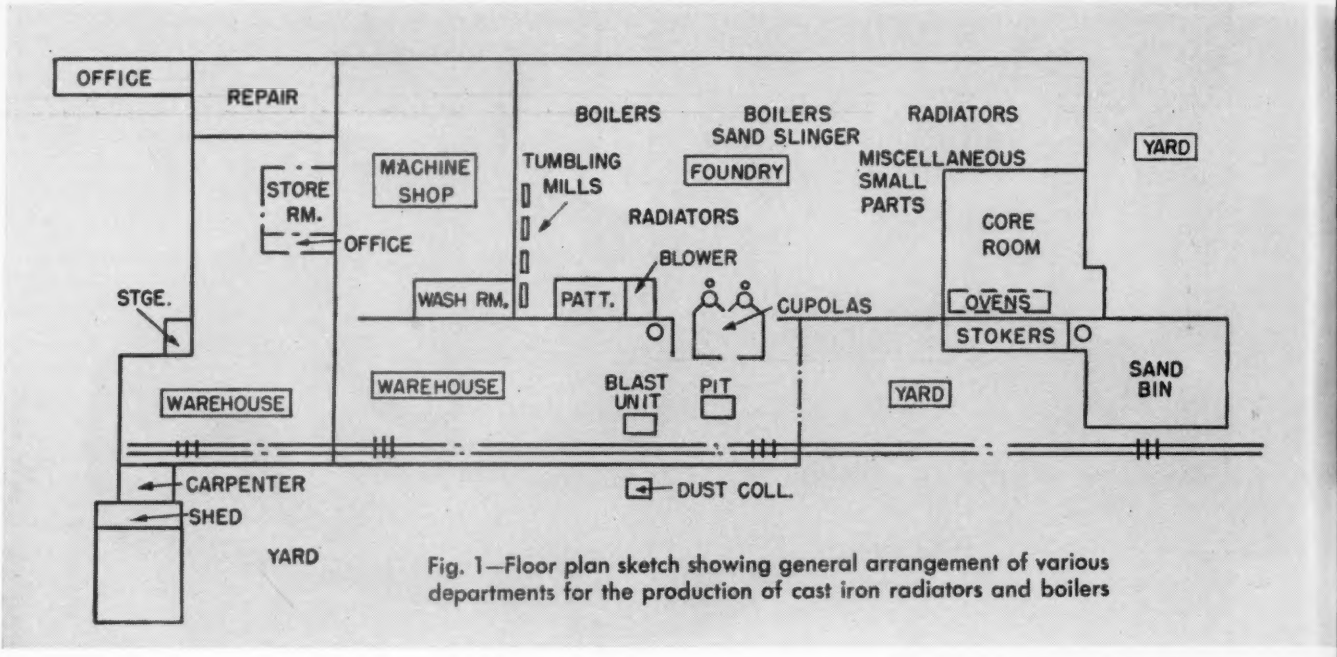


Fig. 1—Floor plan sketch showing general arrangement of various departments for the production of cast iron radiators and boilers

Thin-Section Work Involved in

RADIATOR and BOILER CASTINGS

By EDWIN BREMER
Metallurgical Editor

FOR THE LAST 25 years Dunkirk Radiator Corp., Dunkirk, N. Y., has been producing cast iron hot water and steam radiators and boilers for heating homes, factories and office buildings. During that period it has improved boiler design to effect greater transfer of heat from coal, gas or oil fuel to the water so that present-day units are considerably smaller than their earlier predecessors.

Completed radiators and boilers are made of individual sections which are joined together with tapered nipples forced into place by press fit under high pressure. Prior to assembly, the radiator and boiler sections are subjected to a water pressure test of 80 psi to insure freedom from leakage, and after assembly are tested again at the same pressure.

Both radiator and boiler section castings have relatively thin walls, and molds and cores are controlled closely to produce castings of uniform thickness as well as straightness. Radiator castings have walls 3/32-in. thick and those of boiler sections are 7/32-in. Many foundrymen undoubtedly will be amazed to learn that the cores for radiator section castings are made without any stiffening or reinforcing wires or rods. This is quite a feat when one considers handling radiator cores which range from 17 to 30 in. long, 3¼ to 7⅝ in. wide and 1 in. thick. Some core wires are used in boiler cores which range from 45 to 57 in. long, 18½ to 34½ in. wide and 3 to 6 in. thick.

Dunkirk Radiator Corp.'s plant, as shown in the accompanying sketch, is housed in a structure approximately 220 x 495 ft, and includes machine shop, warehouse and foundry. Since all radiator and boiler sections undergo machining operations —such as reaming to close tolerances the openings into which the joining nipples are fitted, and reaming and tapping the water or steam inlets and outlets—the machine shop requires an area 100 x 140 ft.

The foundry department is 140 x 320 ft and the

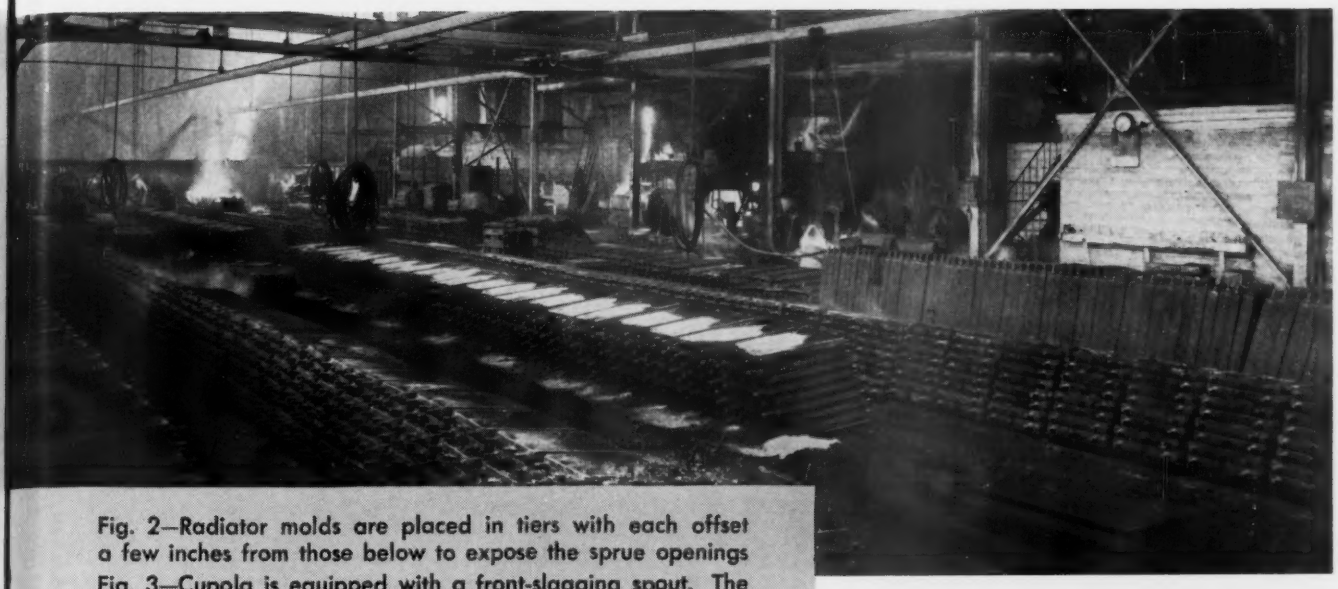


Fig. 2—Radiator molds are placed in tiers with each offset a few inches from those below to expose the sprue openings

Fig. 3—Cupola is equipped with a front-slagging spout. The large, insulated mixing ladle helps provide uniform metal

Fig. 4—Small, miscellaneous parts like smoke hood's, doors and grate bars are produced in snap flasks

coreroom occupying one corner is 80 x 80 ft. Two cupolas are located on one side of the area but not quite centrally. At present, one of the two cupolas is sufficient to meet the required demand of 65 tons of molten iron per day. Lined to 60 in., the cupola melts at the average rate of 13 tons per hour. It is equipped with an air-weight control device, and air supplied may vary from 380 to 560 lb per minute depending upon the iron demand in a given period. As may be seen in the accompanying illustration, the cupola is slagged at the front, the slag flowing into a large steel container or ladle suspended from an overhead rail.

Metal charges weigh 3400 lb and are composed of about 30 per cent pig iron, 40 per cent cast machinery and No. 1 cupola scrap, and 30 per cent remelt or return scrap. This provides an iron over the spout containing 3.50 per cent TC, 2.20 to 2.30 per cent Si, 0.70 to 0.80 per cent Mn, 0.50 per cent P and 0.100 per cent S. As the composition warrants, additions of silicon carbide and ferromanganese briquets are made.

Pig iron and scrap are transported from the adjoining metal storage yard to the charging floor by a magnet suspended from a crane and placed either on small cars or on the floor. Cars of material are weighed carefully, manually pushed about 10 ft to the cupola, and the contents placed in the cupola by hand. Coke is brought to the charging floor by crane and bucket and discharged on the floor. It then is forked into wheelbarrows, weighed and dumped into the cupola.

During the heat, the molten iron flows continuously from the cupola into a 5-ton capacity, covered and insulated forehearth. From the forehearth it is transferred to pouring ladles holding 500 or 1000 lb. The former are used in filling radiator section and miscellaneous parts molds and the larger ladles for filling boiler-section molds. Metal temperature is taken at the spout every half-hour with an optical pyrometer and averages 2750 to 2800° F. From time to time, temperature checks are made at the mold sides to see that the pouring temperature is within the desired range of 2600 to 2650° F.

Radiator and boiler sections, as well as miscellaneous small parts such as smoke hoods, ashpit, flue and furnace doors, grate bars, etc., are molded by hand on the floor with the exception of the largest and heaviest boiler sections, which are made with a mobile sandslinger. Two natural molding sands are used for production of castings. Sand employed for radiator sections and miscellaneous parts has an AFS grain size of 70 while that used for boiler sections is 50 AFS fineness. Moisture content for both is maintained at 5½ to 6 per cent. Green compression strength ranges from 6½ to 7 psi, and the permeability from 70 to 80 for radiator sections and 90 to 100 for boiler sections.

Radiator sections are made on 16 floors using special pin-lift molding machines on which a pair of cast iron patterns are mounted. Each of the patterns contains a number of small holes about

Fig. 5—Partial view of coreroom, with benches at lower left. Ovens are batch type and located behind the hooded area. Cores handled on racks are moved by lift truck

Fig. 6—View taken along one of the molding floors on which radiator sections are made. Sandslinger, left, is used to make boiler sections

1/16-in. in diam and spaced about 6 in. apart along the bars or tubes for setting of wire-type radiator chaplets to support the core. Stems of the chaplets project 3/32-in. into the pattern against carefully adjusted stops so that when the mold is completed they extend exactly that distance into the cavity to locate the core centrally. Pins for lifting the flask vertically above the pattern about 1 in. are located near each corner of the long dimension and operated by a lever and eccentric.

Each floor is operated by two men and, since the radiator sections are symmetrical, only one molding machine with its set of patterns is required.

Thin, flat finger gates are attached to the patterns at one end, and in making cope molds a sprue plug is attached to the main runner, while with drag molds the plug is removed. At the beginning of molding, the sand on each floor is in a long windrow down the center. That arrangement is the result of the previous night's shakeout and reconditioning of sand with a mobile sand cutter. The molders first lay down two rows of perforated cast iron bottom boards, one on each side of the windrow. Boards are supported on the end nearest the windrow by 2 x 4-in. boards laid flat. The other end of the bottom board rests on the floor. The molders place the molding machine at one end of the windrow, set the chaplets on the pattern and then put the flask in position. A thin layer of facing sand containing about 10 per cent seacoal is riddled on; then sand from the floor is shoveled in until the flask is partially filled. Sand is peened around the edges of the flask and tucked under the bars. The flask is filled with sand, which

Fig. 7—Before cores are taken to molding floors they are inspected. A few boiler cores are made in two sections and then pasted together

is rammed all over and then struck off. The flask then is raised off the pattern by the pin lift mechanism, picked up by the operators, one at each end, and placed on one of the bottom boards.

This operation is repeated until a number of drags are laid out on each side of the sand windrow. Cores then are set, and sufficient copes are made to cover the drags. A second set of drag molds is made and is placed in an offset or staggered position on top of the molds just closed. The offset or stagger is about 3 inches so that the sprue opening of the mold below is available to receive molten metal from the pouring ladle without interference. As before, the cores are set, the copes made, the molds closed, and the cycle of operations continued until stacks of molds, four-high, have been completed.

During production of the stacks of molds, the molding machine from time to time is advanced along the receding face of the sand windrow. Eventually the machine reaches the end of the floor, the sand is all used up, and the two rows of stacked molds completed. While the description appears somewhat complicated, the various operations are completed rapidly. At present about 5000 radiator sections are produced each day on the 16 floors. Number of sections made on each floor will vary according to the size of the section. Sizes range from three to six tubes and 19 to 32 in. in length.

As mentioned earlier, boiler sections are made by hand and by use of a mobile sandslinger. Single patterns are mounted on pin-lift machines similar to those used for radiator sections. The procedure for hand molding follows that for radiators, except that molds are lifted from the machines and set out on the floor with air hoists suspended from overhead rails. Mobile sandslinger is used for making the largest and heaviest boiler sections to reduce labor fatigue in ramming large flask areas. Molds are stacked or staggered as in the case of radiator sections. Nine floors are devoted to molding of boiler sections, and they produce 450 to 500 sections a day. Miscellaneous small parts such as ash-pit, flue and furnace doors, smoke hoods, grate bars, etc., are made by hand in snap flasks. Molds are set out singly on the floor.

Cores for radiator and boiler sections and other parts are made by hand. Sand used is lake-type silica of about 50 AFS fineness, and bond is core oil. Oil-sand ratio is 1:46 for radiators and small parts, and 1:70 to 1:80 for boiler sections. Radiator and boiler cores are made in half core-boxes, "booked" in the green state to form single units, placed in core driers, and set on racks. Racks are moved by lift truck into any of nine batch type, recirculating ovens for baking. Six of the ovens are stoker fired with bituminous coal and three are gas fired. Fronts of the ovens are covered by a large hood which is attached to an exhaust system to carry away the smoke and fumes from the hot cores as they are removed from the ovens.

Poured molds are shaken out at night by a special crew. Sand and radiator sections are dumped in the center of the molding floor and the flasks and bottom boards piled along each side. Castings are snaked out with hooks, piled on small skids and transported to one end of the foundry. There the gates are knocked off and the sections loaded compactly into any of five tumbling mills. Rotation of the mills removes core sand from the interiors, knocks off the outside chaplets as well as any adhering sand, and provides a smooth burnished surface on the radiator sections.

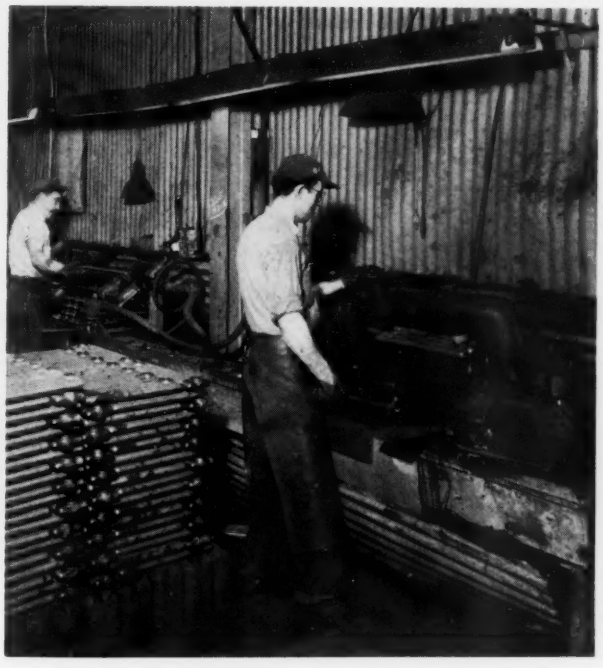
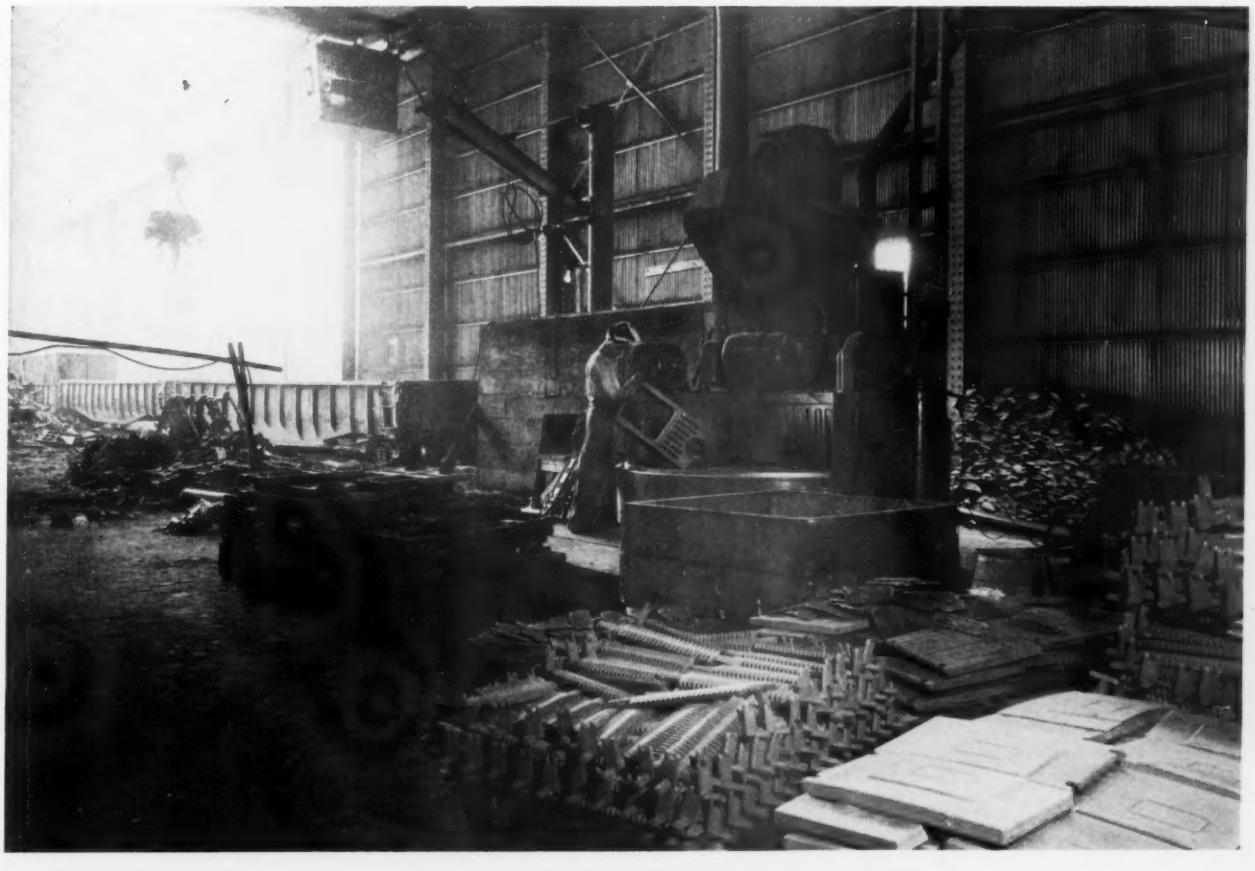


Fig. 8—All radiator and boiler sections undergo pressure tests to insure freedom from leakage

Cleaned sections are removed from the barrels, loaded on skids and carried into one section of the machine shop where they are subjected to a water pressure test at 80 psi. After testing, the sections are taken to another part of the machine shop where the inlet and outlet openings are reamed to the proper size and taper for insertion of the nipples used to assemble a series of sections together. On end sections the inlet and outlet openings are reamed and tapped or threaded for attachment of pipe. Sections are joined or assembled by insertion of nipples between sections and forcing them together under hydraulic pressure in presses. After assembly, the units again are subjected to a water pressure test at 80 psi to insure freedom from leaks.

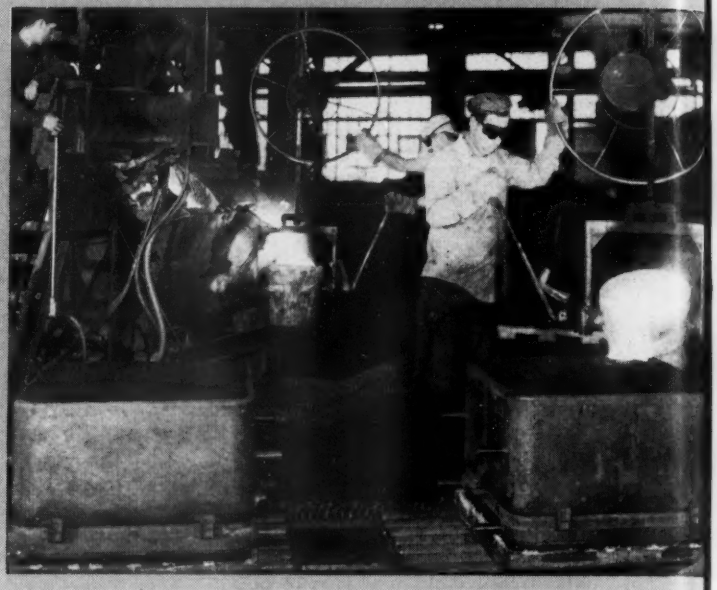
Boiler sections and miscellaneous small parts are cleaned on a table type abrasive blast unit. The boiler sections after cleaning are subjected to water pressure testing, machining operations and assembling similar to those employed on radiator sections.

Fig. 9—Boiler sections as well as grate bars and other small parts are cleaned by abrasive blast



Mechanization

Scrap is pulled from side bins into drop-bottom buckets, is carefully weighed and lifted by chain hoist to the cupola doors



Metal for the east bay small motor line is tapped directly into small ladles for pouring into molds on continuously moving conveyorized line

In east bay squeezer section, drags are placed onto a feeder conveyor where cores are set and copes placed before mold moves onto mold train

Doubles Production

By KENNETH L. MOUNTAIN
Associate Editor

ELLIOTT CO. has been designing and manufacturing steam and electrical products for over 50 years. From a meager beginning in a small frame building and one product—a boiler tube cleaner—the company has expanded to become a leading manufacturer of major power and industrial process equipment, both steam and electrical.

The company, with headquarters and main works in Jeannette, Pa., also operates divisions in Ridgway, Pa., Newark, N. J. and Springfield, O. It manufactures steam turbines, turbine-generators, motors, condensers, ejectors, deaerating heaters, centrifugal compressors, turbochargers and scavenger blowers for diesel engines, strainers, filters, and tube cleaners for power plants and industry.

Castings for these diversified products are made at the company's foundry in Jeannette. An increased volume of business, development of new products and company expansion made it imperative to mechanize the foundry to keep pace with casting requirements.

Renovation was started in the spring of 1952. The main building was extended 180 ft and a mezzanine floor was included in the 40,000 sq ft gained. A third cupola was built to supply special metal for a new self-contained, conveyorized, small motor line. A stationary sandslinger with its own roller conveyor line was established. Departments were rearranged to gain floor space, and four deep pits to handle larger molds were provided. All coremaking operations, with the exception of large cores for the main bay, were transferred to the new mezzanine floor. A mechanized sand handling system was installed for all molding and coremaking stations. New washrooms and locker rooms were provided.

Production Up 50 Per Cent: On Nov. 3, 1953 sand began to flow over the new belts. Before mechanization, production was short of 300 tons monthly. Today, after two-years' experience with the new system, production is over 450 tons of clean castings monthly, using the same manpower. In 1955, nearly 7000 tons of metal was melted to yield almost 4400 tons of sound castings.

Working a one-shift, five-day week, the foundry employs 184 persons—44 molders, 32 coremakers, 39 chippers and 69 men performing other tasks.

The outside scrap storage yard is serviced by a 10-ton yard crane running on tracks supported by concrete A-frame piers on one side, with rail attached to foundry building on the other side. Scrap is unloaded by magnet from railroad cars that enter the scrap yard on a track that runs the length of the area. Scrap is lifted by magnet and elevated to side bins on the charging floor level.

Scrap used is purchased material generally consisting of motor blocks, radiators and heavy machinery cast in addition, of course, to local foundry returns.

Three cupolas, two lined to 54 in. and one lined to 32 in., are operated. Large cupolas are intermittent tapping, rear slagging type while the small cupola is a continuous tapping, front slagging type. All are acid lined. The small cupola is used daily and patched at night; the larger ones are used on alternate days.

Cupola Charges: Cupola charges approximate 2000 lb for the 54-in. cupolas and 700 lb for the 32-in. cupola. Two basic metals are poured and an average for each is:

"B"		"E"
1100 lb	Steel scrap	380 lb
———	Iron scrap	560 lb
700 lb	"B" return	———
———	"E" return	560 lb
420 lb	Silvery pig	80 lb
80 lb	Pig iron	420 lb
300 lb	Coke	260 lb
70 lb	Limestone	70 lb
10 lb	Si briquets	21 lb
7 lb	Mn briquets	7 lb
4½ lb	Flux	4½ lb

Thirty tons are melted daily. Metal is treated according to the proprietary Meehanite process. Metal is tapped at 2800 to 2900° F and poured at about 2700°F. Practice dictates never to pour the last drop of metal in the mold but to pig the last 200 lb or so. Experience in this foundry has indicated that pigging eliminates all defects sup-

East bay castings are taken from conveyor after shakeout and then are trucked to cleaning room

View of main bay from mezzanine floor. Motive sandslinger services pits and floor from track

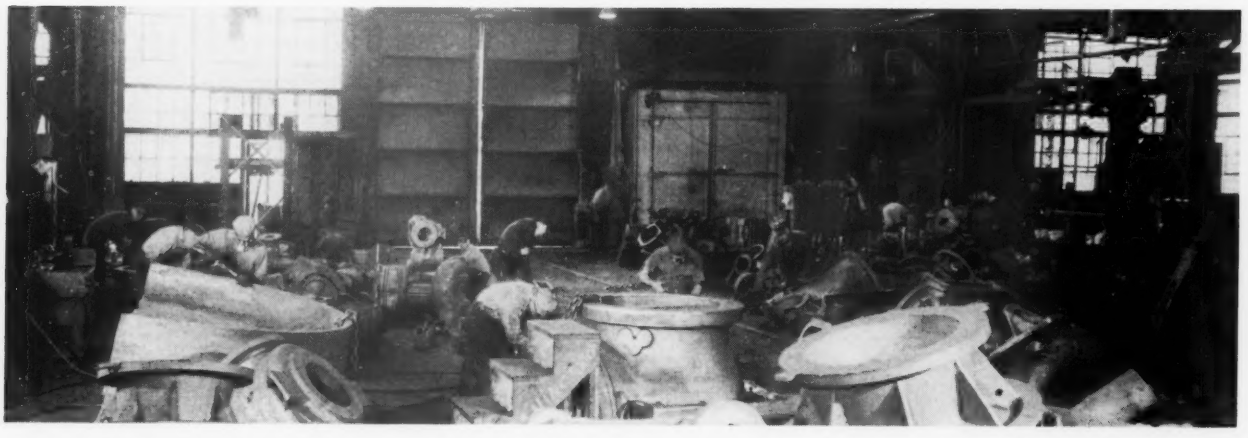
posedly caused by cold metal. Any required adjustments in silicide additions to the melt are made on the basis of a chill test from each tap. Small triangular test bars are made in small core molds. A chemical laboratory checks every heat physically and chemically, and complete records are kept on each heat.

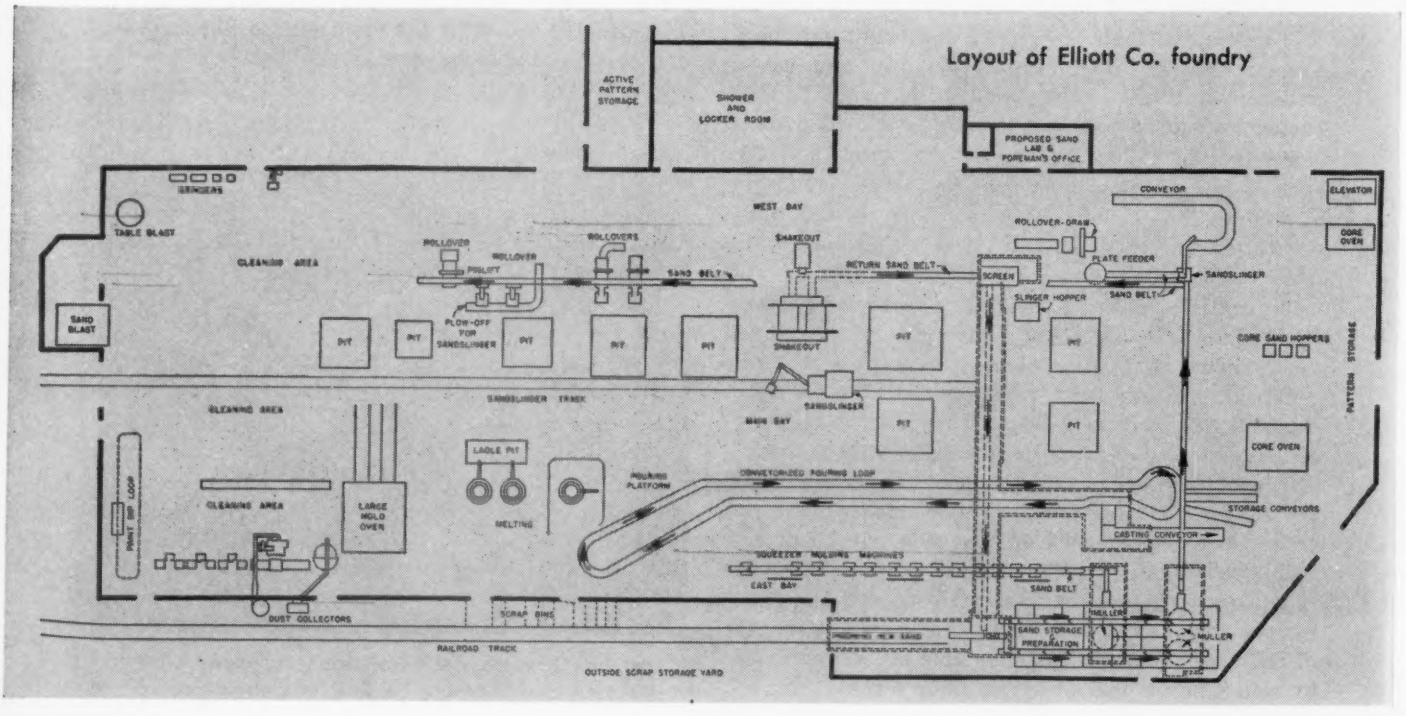
The foundry building is about 140 x 420 ft, divided longitudinally (see accompanying layout) into three bays (west, main or center, and east) by steel columns on 20-ft centers that support crane runways. Since there are wide variations in the size of castings made in these bays, each will be discussed as a separate unit.

East Bay: Castings made in this section are for use in the company's small motor line, 1 to 200 horsepower. They have section thicknesses of $\frac{1}{8}$ to $\frac{1}{4}$ in. and weigh 8 oz to 175 lb.

Molding equipment consists of two arm lift rollovers, four jolt-squeezers, two drag-rollovers, two squeeze-strippers and one special jolt-rollover. The

Cleaning area for large castings produced in the main bay. Equipment includes a shot blast room





Layout of Elliott Co. foundry

arm lift rollover units are confined to matchplate work in flask sizes of 14 x 16 in. to 21 x 21 in. The jolt-squeezers handle flasks 10 x 12 in. to 14 x 16 in. The two drag rollovers do work up to 16 x 18 to 24 x 24 in. while the other is confined to 24 x 24 and 30 x 30 in. All flasks are steel using cope and drag boards. The special jolt-rollover unit does short-run and miscellaneous work.

Molds move from the molding line to the pouring conveyor on 24-in. wide gravity roller conveyors that vary from 10 to 17 ft in length. The squeezer molds are palletized, and the pallets are as long as the mold cars to facilitate loading. The drag rollovers and jolt-squeeze strippers work as teams. Drags are pushed out of a machine to feeder conveyor of mold train where cores are set, cope placed and the completed mold pushed on mold train for pouring.

Molten metal for castings made in this bay is taken directly from a holding ladle at a front-slagging 32-in. cupola in pouring ladles of varying capacity that are part of a monorail pouring system. This system, which can be controlled to move from 6 to 24 ft per minute, is about 425 ft long. It contains 76 mold car units, each 30 x 54 in., in steel frames spaced at 66½-in. intervals. Each unit contains two rows of 16-in. and two rows of 6-in. rollers, placed parallel to the direction of travel so that molds can be moved onto them from the molding conveyor lines.

The conveyor makes a complete loop at a north end station where three 24-ft-long by-pass storage conveyor extensions are located. Castings in tight flasks are lifted by 1-ton air hoist to a 4 x 6 ft shakeout deck or are tipped or pushed by hand from the conveyor onto a shakeout. Flasks continue to molder stations. Sand drops through the grid to a 24 x 72-in. electrically vibrated feeder pan and onto a 24-in. shakeout belt conveyor 42 ft long that moves the sand onto a cross magnetic belt conveyor and into the proper returned sand storage bin.

Castings are moved from the shakeout grid to a casting conveyor belt. From there they are segregated into metal tote boxes for movement by fork truck to the cleaning room area at the south end of the line.

Cleaning room equipment for this line consists of four stand grinders, one 6-ft table-room blast machine and one airless blast barrel. Removal of fins, sprue and flash prior to paint dipping is done with hand tools on a 40-ft bench. All castings from this bay are moved by monorail conveyor through a paint dip tank before being palletized for movement to other departments and subsequent assembly operations. All castings are used in the company's own operations and an estimated 90 per cent of castings require some kind of machining before final assembly into the finished products.

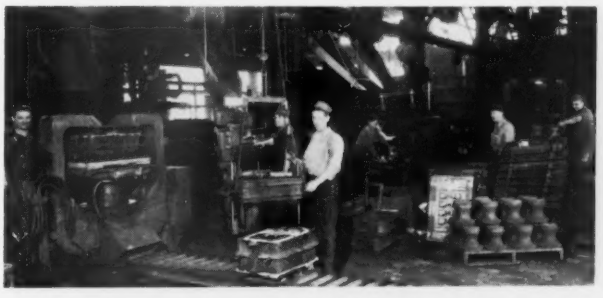
Main Bay: In this section, large heavy castings are made in flasks or large pits on either side of a central gangway and track on which runs a large, motive type sandslinger with a 19-ft swinging radius. The sandslinger has two extra hoppers of 20 tons each to minimize delay during ramming operations. Track runs the full length of the bay.

In addition to several 1, 2 and 5 ton air and chain hoists, a 20-ton, 50-ton and a 75-ton crane span this bay.

Nine pits, all 8 ft deep, are provided for large castings. Measurements range from 12 x 12 ft to 20 x 24 ft. Two large mold ovens, 20 ft wide by 24 ft deep, are used for large cores and flask molds and eliminate use of open gas flames except on pit jobs.

Metal for pouring in this bay is tapped directly to pouring ladles of 2000, 3000, 6000, 10,000, and 30,000 lb capacities. These ladles are carried by overhead cranes to areas where molds are in pits or on the floor. Castings range from 2500 to 40,000 lb. Ladle capacity to pour 60,000-lb castings is available. Heaviest casting poured to date weighed 42,000 lb and had a maximum section thickness of 1½ in. (plus ribs and flanges up to 5 in. thick).

Castings poured on the floor are taken by crane to a 6 x 8 ft dual shakeout near the center of the bay. Sand falls through the grid to two 16 x 24-in. electrically vibrated feeder pans, onto a conveyor belt, through a breaker screen and onto an underground cross magnetic conveyor belt for movement to the other side of the foundry and into return sand storage bins.



West bay molding equipment handles castings up to 2500 lb that are made in standardized flasks

Castings are removed to the cleaning room by cranes or hoists and into a 14 x 16-ft shot blast room. Gates and risers are cut off with welding torches, and the castings are finished with portable grinders and chipping tools. Castings are placed on a railroad flat car that moves inside the foundry building for transfer to other operations within the grounds. Such a system minimizes rehandling of large castings.

Cleaning time is minimized and good surfaces assured on large flask and pit castings by the molding techniques developed through years of experience with the motive sandslinger. Head of the slinger rammer is never held closer than 4 ft above the pattern. Dry sand facing is spread on the drag side of the pattern to a depth of 4 to 6 in. Several passes are made at slow speed, until the rammed depth is about six in. The flask

Stationary sandslinger with 8-ft boom operates in a conveyorized unit at north end of west bay

then is filled at high speed.

As all-purpose flasks are used, gaggers are placed in the cope in varying quantities. When gaggers are set, no less than 2 in. of facing sand is used before placing. Then gaggers are covered with another 2 in. of facing sand. Gaggers are peened in place with a hand rammer and the cope is given the same treatment with the slinger as the drag receives. With this method, the mold hardness for the drag and cope averages between 76 and 86.

The green mold is sprayed with blacking and allowed to sit until the blacking penetrates. Water then is brushed on the mold with a camels hair brush to aid in assuring a fine casting finish. There are no swabs in the foundry. Deep pockets are finished with a long-handle camels hair brush.

The blacking mixture is made up of a commercial plumbago mixed with clay and water to 40° Baume.

West Bay: Castings ranging up to 2500 lb are poured in this area. Metal is tapped from the cupola into 1500 to 4000-lb ladles, placed on a transfer car by overhead crane and then is picked up by any one of three 5-ton cranes and transported to the area where molds are on the floor.

Molding equipment consists of two 1500-lb jolt rollover machines, one jolt-squeeze strip rollover machine and one 3000-lb jolt-strip rollover machine. The rollover and strip machines work as teams. Four sizes of standard flasks ranging from 18 x 18 in. to 36 x 36 in. are used.

At the north end of this bay, a stationary sandslinger with an 8-ft boom operates in its own conveyorized unit. This unit has eliminated all floor molders from this section. Loose patterns are rammed the same as mounted patterns. Patterns and flasks are placed on the conveyor and pushed to the ram-up station. Five sizes of standard flasks ranging from 30 x 30 in. to 52 x 52 in. are used.

Four to six inches of sand is plowed off the slinger belt onto the pattern (to protect patterns) before ramming at high speed. Flasks are struck off and moved to the 5000-lb rollover machine. Mold is rolled over and pattern drawn. Mold continues down conveyor line where it is finished. It is picked up by overhead crane, set on floor, skin dried and made ready for pouring. An all-facing sand is used on this system.

After pouring, the molds are picked up by overhead crane, taken to a 4 x 6 ft shakeout. Flasks are returned to the ram-up area. A crane takes castings from shakeout for placement in casting buckets and removal to the cleaning area.

A 4 x 6-ft shakeout grid adjoins the main bay shakeout and uses a common conveyor belt with that unit to return sand to the cross-magnetic conveyor belt and into proper storage containers. This cross-magnetic conveyor belt cuts across the width of the foundry in an underground trench. It pours sand into a bucket elevator for transfer to return sand storage bins.

The cleaning room for this area at the south end contains a 6-ft table blast machine, two stand grinders and a heavy-duty band saw. Portable grinders and chipping tools are used in finishing castings before placing them on a railroad flat car with castings from the main bay.

Before mechanization, ten natural bonded sands were used. Today, three compounded sands meet all requirements. Main bay uses a New Jersey silica base sand of 33 AFS fineness. West bay uses a Michigan City base sand of 53 AFS fineness and the east bay uses a New Jersey silica base sand of 80 AFS fineness. Core sands of 53 AFS fineness are used in the main and west bays and 80 and 53 AFS core sands are used in the east bay.

New sand in railroad cars is brought inside the foundry building and dropped through a screen in the floor to an underground apron belt conveyor. This belt moves the sand to a bucket elevator for delivery to one of the three new sand storage bins, two of 90 and one of 160 tons capacity.

Return sand is stored in bins of 60, 160 and 320 tons capacity. Both new and return sands for the east bay motor unit are kept within a closed system and are not mixed with the sands from the other two bays.

New and return sand move directly from the storage bins by conveyor belts to one of three 3000-lb-capacity mullers. Motor-driven weigh

Final grinding and clean-up of end bells from east bay prior to immersion in paint dip tank

lorries and automatic moisture control equipment are incorporated in the mulling operation to assure control of each mix. Basic main bay facing mixture consists of 2000 lb of system sand, 1000 lb of new sand, 30 qt pitch, 20 qt wood flour, 30 qt bentonite and 20 qt clay. A three-ram test indicates these properties: Permeability 65, green compression strength 9.5 psi, moisture 5.9 percent, mold hardness 83. Clay content is 8 per cent.

West bay facing mixture consists of 2840 lb of Michigan City sand, 10 qt pitch, 10 qt seacoal, 10 qt wood flour, 4 qt bentonite and 4 qt clay. Properties developed are a permeability of 80, green compression strength of 8 to 11 psi, with 3½ to 4½ per cent moisture. Clay content is 6.4 per cent.

East bay uses an all-facing sand mix consisting of 3000 lb of New Jersey silica sand, 15 qt seacoal, 15 qt wood flour, 5 qt western bentonite and 5 qt southern bentonite. Properties developed are a permeability of 60, green compression strength of 14 psi, with 3 per cent moisture.

Prepared sand for the east bay unit moves from the muller on a cross belt to a bucket elevator, then through an aerator to a 24-in. distributing belt conveyor. Thirteen plows divert sand to molders' hoppers. Access to the plows is gained from a catwalk.

Sand for the main and west bays is delivered from the mullers on a collecting belt conveyor, carried to a bucket elevator and dropped to a 24-in. cross-belt conveyor and moved across the top of the foundry to another 24-in. sand distribution conveyor belt equipped with nine plows over molding machines and chutes.

Sand for use in the large motive sandslinger in the main bay is plowed into a chute from where it is directed into the slinger hopper of 20 ton capacity. The loaded hopper is then moved by crane to the slinger. Two extra slinger hoppers are filled while the slinger is operating.

Black core sand for large cores made in the main bay also is plowed off this same distributing system. Sand for the small stationary sand slinger is plowed off the distributor belt to a plate feeder and up an inclined belt directly into the slinger hopper.

With the exception of the extremely large cores for the main bay, the coremaking operations are confined to the mezzanine floor. Cores from a few ounces to 3 tons are made. All cores are of the oil sand type. Seven benches for small miscellaneous work and nine "horses" for making medium-sized cores for castings up to 2500 lb are complemented by five coreblowing machines, one hand jolt rollover and one rockover machine. Thirty-two coremakers are employed in this department.

Ninety per cent of all cores used in the foundry are made with a simple mixture of 360 qt Michigan City sand, AFS fineness of 53, 5 qt oil and 15 qt corn flour.

Main bay cores, because of their large size, are made from the following mixture: 360 qt Michigan City sand, 27 qt oil, 15 qt silica flour, 35 qt graphite, 10 qt corn flour and 15 qt other binder. This batch makes a mixture of 1080 pounds and is used for cores weighing from 500 lb up to 3 tons.

A reverse belt under incoming sand hoppers picks up new sand and elevates it to a belt from which it is plowed off into three storage hoppers on the mezzanine floor. Core sands are mixed in a 1500-pound-capacity muller and discharged into a three-wheeled truck for transportation to coremaking stations. Future plans call for this system to be replaced by a conveyor belt to carry sand to each coremaking station.

Cores are placed on racks at each station and transported by this truck to either a two-rack oven on the north side or a three-rack and a six-rack oven on the west side of the mezzanine. Cores are taken from the ovens when baked and sent

Coremaking section handles many complex cores, including rings that require hand-set blades

downstairs on a large freight elevator for distribution to molding stations.

Exhaust fans spaced at regular intervals in the ceiling and exhaust systems for each shakeout, grinding and blast cleaning unit are connected with a large outside dust collector to minimize dust and dirt.

Twenty-five patternmakers are employed in a large and well equipped pattern shop located several hundred feet from the foundry building. A minimum amount of new pattern work is done as facilities are occupied with repair maintenance and setup operations.

Pattern storage building measures 60 x 309 ft with a 20-ft mezzanine on each side of an open center bay. Patterns are cataloged and stored on steel racks. Several thousand patterns are inventoried in this and three other buildings.

Questions and Answers

Carbon dioxide process involves conversion of sodium silicate to silica gel . . . Standard time or data method for determining the rates for molding payments . . . Cites some precautions for core mixing when using dry resins . . . Wants information on molding lead figures . . . Riser weights . . . Suggests plaster molds

How the CO_2 Process Functions

QUESTION Can you give us any information on the carbon dioxide process for making molds and cores? How are those hardened so that they can be handled in such a short period of time?

ANSWER As described in articles published in the June, 1955, and January and March, 1956, issues of FOUNDRY, a proprietary sodium silicate-base material is used as the binder for the sand, which essentially is clay-free. When the silicate binder comes in contact with carbon dioxide, the silica is precipitated in the form of a gel which cements the sand mass into a rigid structure.

With small and medium size cores and molds which can be penetrated easily and thoroughly by the carbon dioxide, the reaction occurs in 15 to 30 seconds. However, with large molds and cores, where gassing with carbon dioxide must be accomplished by stages or steps in different parts, considerably more time is required.

Method for Setting Mold Rate

QUESTION We recall references to methods for setting prices or rates on molding for foundries which were based on flask size, cores to be set, etc. Do you have any information on this subject?

ANSWER At various times information has been published on the method you mention for setting molding rates. Usually it is termed the standard time or data method. As you indicate, it involves such factors as the size of flask to be filled, peening if required, ramming time whether by hand or machine, as well as other operations employed in making a mold or core.

Data on actual times required for the various operations are obtained from representative and careful time studies conducted in the particular foundry. Those data, with allowances for fatigue, are arranged in tabular form for each of the operations. With a given pattern and flask size, it is possible to ascertain from the tables the time required to make the mold.

Articles relating to the subject include: "Bench Coremaking Time Standards for Job Shops," FOUNDRY, November, 1944; "Developing Standard Data Tables for a Four-Man Molding Unit," *Transactions*, American Foundrymen's Society, 1949; "Time Study Techniques," *Transactions*, American Foundrymen's Society, 1947.

Process Uses Silicate Binder

QUESTION Recently we saw references to a molding process using ceramic material. It appeared to resemble investment molding practice except that permanent patterns instead of an expendable type are employed. Can you supply any information on the method?

ANSWER Apparently you refer to the Shaw or Osborne-Shaw process developed in England some time ago. Permanent metal patterns are used, although wood patterns, coated with alcohol-resistant materials, or plaster patterns also can be employed. The refractory may be sillimanite, zircon sand, etc., and it is bonded with partially hydrolized ethyl silicate plus a catalyst to control the gelling action.

Flasks are formed of L-shaped segments which are clamped together around the pattern. The molding material—usually in slurry form although it may be just plastic—is poured into the flask, and sets or hardens sufficiently to handle in a short period of time. Setting or gelling time is controlled by the amount of catalyst, and may range from a few minutes to hours as desired.

After gelling, the flask is removed and the mold lifted from the pattern. The lift is not difficult since the mold is somewhat rubber-like and can be flexed. The mold is ignited to burn off the alcohol, which is one of the reaction products resulting from combination of the catalyst and hydrolized ethyl silicate. The mold is placed in a furnace and heated to around 1300°F to drive off all moisture. Molds may be poured hot or cold depending upon the alloy used, section thickness and intricacy of casting to be produced, etc.

Precautions in Coremaking

QUESTION We are using dry phenolic resin to coat silica sand for blowing cores. We recognize that during sand preparation and coremaking, persons allergic to resin should not be present, but are not entirely clear on two other points. First, does non-cured powdered resin have any effect on health other than dermatitis? Second, when green sand molds containing resin-bonded cores are filled with molten gray iron, how does toxicity of smoke and fumes compare with similar products given off when other core binders are used?

ANSWER Presumably in preparation of the coated sand you are employing hooded equipment in a well ventilated area and the operators wear respirators. Those precautions should be followed since both the sand and the resin are dry and finely divided, and tend to create dusting conditions.

So far as we know, gases given off by cores when in contact with molten metal do not create a health hazard under ordinary conditions. Usually those gases are diluted considerably by the surrounding atmosphere and are considered as merely a nuisance due to their acrid odor. To minimize this nuisance and provide satisfactory working conditions, it always is advisable to pour in a well ventilated area. If the system is conveyorized, the molds should move into a hooded and ventilated section immediately after pouring.

Sand-casting Figures in Lead

QUESTION Could you recommend a concise yet simple textbook on the casting of lead alloys? We are planning to make some small sand-cast figures weighing from ½ to 1 lb each, and wish to have as much information as possible before proceeding.

ANSWER Not a great deal of information on casting of lead and its alloys is available in the literature, let alone texts or books. However, due to its low melting point, lead can be poured into a variety of molding mediums. These mediums include

metal, plaster, sand, wood, rubber and even special paper, as typified by stereotype and other mats for printing purposes.

Lead's melting point is approximately 621°F, and the pouring temperature may range from 50 to 150° higher, although it is preferable, as in the case of other metals and alloys, not to have it any higher than necessary to obtain sound castings.

Lead is considerably heavier than other metals and alloys used for castings. It weighs 0.41 lb per cu in., compared with 0.26 lb per cu in. for gray iron and 0.32 lb per cu in. for tin bronze. Since it is quite fluid at the usual pouring temperatures, sand molds must be constructed sturdily. Flasks should be strong, and the sand must be rammed hard to prevent penetration which could result from the combined effects of high density and fluidity.

Some people recommend the application of graphite on the mold face and core surface. The graphite is slicked on or rubbed in to fill up the voids between the sand grains, but we doubt that you could do that—at least on the mold face—of the figure castings you mention.

Determining the Riser Weight

QUESTION Some time ago we read an article in FOUNDRY on gray iron risers, and now we would like to know the exact formula for the percentage of iron risers to the amount of iron in the casting itself.

ANSWER Your question is not quite clear since it might be referring to yield or to a procedure for determining from the weight of the casting, the proper size of riser to feed it efficiently. Presumably, it is the latter since yield in per cent is found by dividing the weight of the casting by the weight of casting plus gating system, and multiplying that figure by 100.

While considerable work has been accomplished in calculating the proper size of risers for steel castings (see "Risering of Steel Castings" by Bishop and Johnson, February and March, 1956 issues) we do not know of a similar investigation for gray iron.

At various times Harry Kessler, Sorbo-Mat Process Engineers, has suggested that the riser weight should equal the casting weight times a constant or factor based on the class of iron. The constants or factors recommended are 0.02 for class 25 (25,000 psi); 0.05 for class 30; 0.13 for class 40; 0.20 for class 50; 0.33 for class 60, and 0.38 for nodular iron.

The value obtained is the weight of the riser above the mold joint, and a suitable addition is made to that to form a "heel" below the joint. For risers 4 in. or less in diam, the neck opening into the casting is one-half the diam in sq in. For risers over 4 in. in diam the neck opening is equal to the diam in sq in.

Again if one follows the recommendation of Winte and Barlow as described in the article "Effective Shrink-Bob Risers," August, 1945, FOUNDRY, it would not be difficult to determine the riser weight since information is given relative to riser diameters, heights, etc. From those riser dimensions, volume can be calculated; then the weight, and finally the percentage relationship between casting and riser weight can be determined.

Plaster Process for Statuary

QUESTION I am a sculptor and have been looking for more inexpensive ways of casting sculpture pieces in metal. I have cast pewter myself in molds composed of half plaster and half asbestos. Could bronze, iron, aluminum, etc. be cast in such molds? Could you suggest some better investment material which would hold detail, and alloys which would be good to work with?

ANSWER Plaster of paris or gypsum is a medium commonly used for making metal reproductions of the sculptor's art. When handled properly it will provide castings with a fine, smooth surface, possessing excellent delineation of detail—even to accidental scratches or markings on the model. It will serve for all the usual nonferrous alloys — bronze, brass, lead, tin—but not for iron.

The type of plaster or gypsum used is known as "casting" plaster. It may be purchased in prepared form, or can be made by mixing in the dry state, four parts by weight of high-strength, low-expansion plaster or gypsum with one part by weight of fibrous talc. Details on these plasters, mixing and handling may be secured from the several producers.

As you undoubtedly know, there is no specific composition for the term "statuary" bronze, but it seems to fall in the range of 78 to 88 per cent copper, 10 to 18 per cent zinc and 2 to 4 per cent tin. Sometimes the alloy known as ounce metal or 85-5-5-5 is employed. It contains 85 per cent copper and 5 per cent each of tin, zinc and lead. Probably the most suitable aluminum alloy would be the 5 per cent silicon-95 per cent aluminum alloy used for architectural and ornamental castings.

We do not know how familiar you are with the foundry problems involved, but we believe that you will find it well worthwhile to obtain a copy of *Metal Casting of Sculpture* by C. D. Clarke which sells for $6.50. It describes in considerable detail the various steps involved in plaster molding as well as other related phases.

Thinks Combined Carbon High

QUESTION We are operating a small gray iron foundry with about 75 employees and melting around 25,000 lb per day using natural molding sand. Principal production is small castings weighing from a few ounces up to about 10 lb using matchplates. We have been using an all-scrap mixture for the past several years and through inoculation we keep our analysis about what we want. Our latest analysis shows 2.23 per cent Si, 0.45 per cent Mn, 0.116 per cent S, 2.48 per cent GC and 0.71 per cent CC. This is the highest our combined carbon ever has been. Can you tell us how to get the combined carbon down to where it should be?

ANSWER You do not mention having any difficulty with the castings you are producing, such as undue hardness in thin sections. In the absence of trouble, we would not worry too much about the specific amounts of combined and graphitic carbons in the test specimens. As you undoubtedly know, cooling rate has an important effect on graphite precipitation, and it is possible that the particular specimen may have cooled more rapidly than usual, resulting in less graphite and more combined carbon. Shaking out the specimen too quickly, pouring at a lower temperature, using a harder rammed mold, for example, may cause faster cooling.

In our opinion, a much better control than the relationship of carbons in a test specimen, is a wedge bar poured in a baked core sand mold. A bar 4 in. long with the triangular cross section dimensions of ¾-in. base and 1½-in. altitude should serve. It is broken and the depth of the chill in the tip is measured in 1/32-in. The chill depth is correlated with results obtained with the castings

and with the amount of inoculating agent to provide a desired change. With such wedge bar information close control may be obtained on the properties of the castings.

If you think it is necessary to have a higher graphitic content you can try larger additions of the inoculating agent or add some crushed ferrosilicon. Other possibilities are use of higher bed and increased coke splits to permit greater pickup of carbon and reducing the amount of steel scrap.

Method of Making Lead Punch

QUESTION Do you have any information on the procedure for casting lead dies and punches used in the aircraft industry so as to produce a better surface and reduce the time of scraping, grinding, etc.?

ANSWER Presumably your reference is to the production of punches where the cast zinc-base die already is available. The method is to build a form around the die of sheet metal or plywood boards lined with asbestos sheets. The form must be clamped and braced sufficiently to resist the pressure of the molten lead. Interior corners of the form must be filleted properly to prevent leakage of the molten lead since it is extremely fluid and will find its way through minute crevices. Suitable filleting material is fireclay mixed to a stiff paste with three parts of lard oil or kerosene. Plaster sometimes is used.

Material used for punches usually is antimonial lead, and for drop hammers may contain 4 to 7 per cent antimony. If it runs much higher than that, the punches tend to be too brittle for impact blows. In forming presses where tendency toward shock is considerably less, the antimony may be higher. The lead punches usually are poured at a temperature of 800°F, and the pouring is carried out so that the metal is distributed over the die face and not in one spot, which might result in cutting or washing.

Has Trouble with Burning in

QUESTION Recently we read an article in FOUNDRY describing coremaking practice, and noticed that dextrin was included in the core mix. We are having trouble with burning in and would like to know if addition of dextrin will aid in overcoming the trouble.

ANSWER Dextrin, which is made from starch, usually by heating, is an adhesive. It is used to some extent by itself as a core binder, but usually in combination with other agents—generally to provide green strength.

Since it is an adhesive, it also will provide some dry strength. It will have little if any effect, however, on preventing burning in. That trouble may be due to several causes. One of the first to be looked into is the coarseness of sand since the more open it is, the more likelihood of molten metal penetrating into the pores. Possibly that may be corrected by applying a good core wash, which will close up the pores.

Again the trouble may be due to a too rapid collapse of the core, resulting from low hot strength. Hot strength may be increased and rate of collapsibility decreased by additions of molding sand, clay, bentonite, iron oxide, silica flour—or use of finer sand. Without more definite information on the various characteristics of the present sand mix, including grain size of sand, type of metal and location of the core, it is difficult to make suggestions for remedying the situation.

Shows Intergranular Fracture

QUESTION We are sending you a piece of a cast steel specimen fractured by impact rupture and you will note the peculiar structure. Sometimes we obtain the same thing when we make small quantities of carbon steel in a 100-lb laboratory direct arc furnace, and sometimes also with a side-blown converter. Check of the analysis is normal with 0.20 to 0.25 per cent C, 0.25 to 0.4 per cent Si and 0.4 to 0.6 per cent Mn. We suspect that this structure occurs when we are on the low side in Si and Mn. The specimen forwarded has been normalized for 1 hour at 900°C (1650°F) and maintained the glassy structure even after heat treatment. Can you suggest the possible cause of such a structure?

ANSWER Specimen submitted for examination shows the conchoidal or "rock candy" structure identified as intergranular fracture. This structure has been traced to several different causes such as aluminum nitride precipitation at the primary grain boundaries; massive carbides in the primary grain boundaries; extreme cases of type II or network sulphide inclusions; ferrite precipitation as a network at the primary grain boundaries; internal hot tears, and a chain-like prepicitate of some unidentified compounds. It appears, however, that the most likely cause is precipitation of aluminum nitride.

Prevention of intergranular fracture from aluminum nitride precipitation is to see that the steel has a moderately low nitrogen content — below 0.008 per. cent—and that the residual aluminum content is not more than 0.05 per cent. Other possibilities are rapid cooling after solidification through the range from 1700 to 1500°F, or by homogenizing at temperatures in the neighborhood of 2300°F followed by moderately rapid cooling to below 1500°F.

Steel Scrap for Plow Shares

QUESTION We operate a gray iron foundry in India and would like to obtain some information on use of steel scrap to provide long-life castings, such as plow shares. Also something about molding sands, and use of flux in the cupola.

ANSWER Without specific knowledge of your present raw material compositions and metal mixtures, as well as sand mixtures and other practices, we can only make suggestions. For example, in using steel scrap to provide better wearing plow shares, the amount of steel scrap to be used should be just enough to obtain the desired final composition.

In this country, the composition for mold boards, plow points and mold shares contains about 1 per cent Si, 0.70 per cent Mn and 0.40 per cent P. Hence, the pig iron and gray iron scrap, including foundry returns, are selected so that a relatively low Si content is obtained, and then steel scrap is added to adjust the composition. We suggest you try 15 to 20 per cent steel scrap with suitable proportions of pig and gray iron scrap.

Trying to give any information on molding sand is hardly possible without any idea of what you now are using or what is available. Generally choice of sand is a compromise. It should be fine enough to provide the desired surface finish without resulting in blows or other trouble from lack of permeability. Bond should be sufficient to make the sand workable as well as to resist cutting, washing or erosion by the molten metal.

In this country, the usual cupola flux is limestone, and the amount employed is about 3 per cent of the weight of the metal charge. Where the scrap is relatively free from rust and dirt (sand, etc.), less may be used, and vice versa. If the coke is high in ash content, more limestone will have to be used. Essential point is to add just sufficient flux to provide a free-flowing slag. If too much flux is used, it will attack the lining. If not enough stone is used, the slag tends to become sticky and viscous. Sometimes in the latter case addition of a small amount of fluorspar or fused soda ash will make the slag more fluid.

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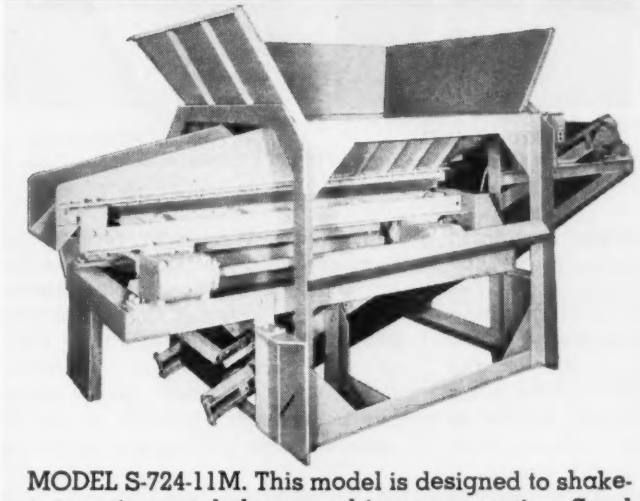

MODEL S-724-11M. This model is designed to shake-out castings and clean sand in one operation. Sand and castings scooped from the molding floor are charged into the hopper and onto a Royer Shake-Out. Castings are discharged at one end at proper height for feeding a table or conveyor where they can be sprued and sorted. Completely cleaned sand is discharged at the opposite end.

CHECK THESE FEATURES

1. **Up to 60 tons of clean sand per hour.**
2. **No pits . . . no excavating.**
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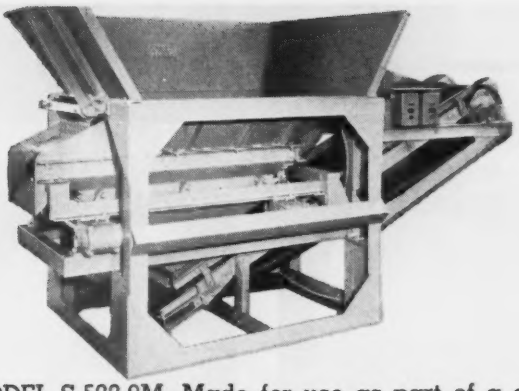
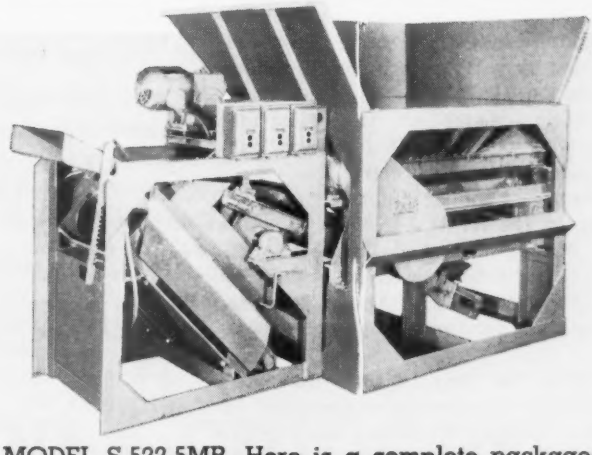


MODEL S-522-9M. Made for use as part of a centralized sand system. The large open-sided hopper directs the complete charge from a front end loader onto a Royer Shake-Out where the large scrap is riddled out. Magnetic separation removes the fine scrap; sand is discharged into a Royer Sand Separator and Blender or the skip hoist to a muller.

The new series of Royer "Scrap Control", with its versatility of application, can supply a varied amount of mechanized casting removal, sand cleaning and conditioning. Here is a unit that puts "mechanization" within the reach of all . . . supplying the benefits of labor saving and production line operation at lowest possible cost.

Take this opportunity to cut down the high cost of hand labor in your sand conditioning operations. Verified results show up to 50% of a night crew released for other work, with the damage by tramp iron to pattern equipment eliminated and scrap losses reduced 75%. We will be glad to study your operation and recommend the proper equipment . . . no obligation, of course.



MODEL S-522-5MR. Here is a complete packaged sand cleaning and conditioning unit. Fed by front end loader, the sand is cleaned by a Royer Shake-Out and magnetic separator, tempered and given final preparation by a Royer Sand Separator and Blender. Unit can be moved by overhead crane, setting up the conditioning operation where desired.

Foremost in Sand ROYER *Conditioning Equipment*

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MEN . . . of industry

DR. JAMES T. MacKENZIE
. . . retires, ACIPCO

ALFRED L. GOSTOW
. . . Chrysler division mgr.

FRED W. ELLIS
. . . joins Hamilton Foundry

CLIFFORD E. WENNINGER
. . . joins Hydro-Blast Corp.

DR. JAMES T. MacKENZIE is retiring Apr. 7 as technical director, American Cast Iron Pipe Co., Birmingham. After a short vacation he will be associated with Southern Research Institute and will also be available as a consultant. A graduate of University of the South, Dr. MacKenzie joined American Cast Iron Pipe Co. in 1912. Since 1918 he has devoted his entire time to experimental and research work. Recognition of his contributions to the metalworking industries have been accorded by various technical organizations. In 1937 he received the J. H. Whiting Medal of the American Foundrymen's Society of which he is a past national director. He was a member of many important committees of the AFS, American Institute of Mining and Metallurgical Engineers, and American Society for Testing Materials. ASTM awarded him its Award of Merit in 1953.

Elvin W. Day, with Ford Motor Co.'s manufacturing engineering office, Dearborn, Mich., was named manager of the aluminum foundry the company plans to build in Listerhill, Ala. Offices of the new plant will remain in Dearborn, for the present. Mr. Day has been active in the company's reorganization of manufacturing operations and spent 4 months in Europe last year reviewing expansion programs of its foreign subsidiaries.

Winston Pfancuff was elected vice president and a director, Globe Iron Co., Jackson, O., in addition to his duties as secretary.

Alfred L. Gostow was appointed general manager of the Forge and Foundry Division, Chrysler Corp., Detroit, unit of a new manufacturing group recently established by the company. The division includes the Dodge Forge Plant and Winfield Foundry, in Detroit, and the Forge Plant in New Castle, Ind. Mr. Gostow attended Armour Institute of Technology and joined Chrysler in 1942. For the past year he was manager of methods for the Dodge Division.

Fred W. Ellis, for the past 2 years assistant to the president, Bay City Foundry Co., Bay City, Mich., was appointed foundry engineer, Hamilton Foundry & Machine Co., Hamilton, O. Mr. Ellis was graduated from University of Minnesota. Previously he was foundry engineer, Richmond Foundry & Mfg. Co., Richmond, Va., and assistant chief inspector, Gunite Foundries Corp., Rockford, Ill.

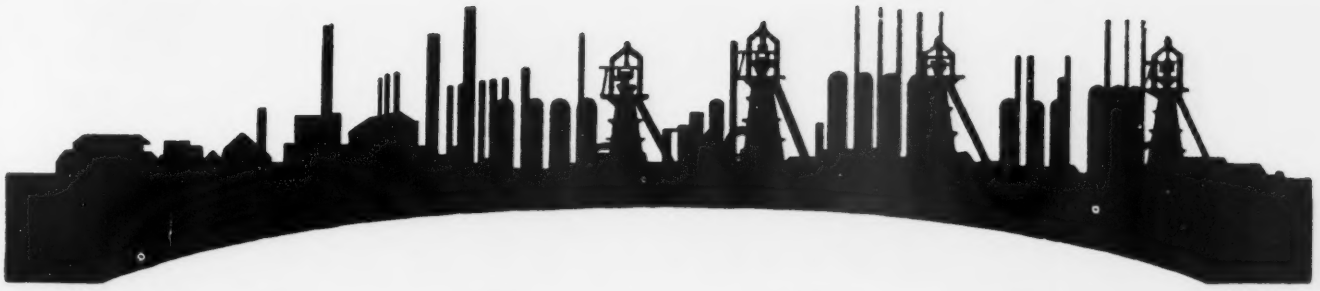
Robert H. Miller was appointed purchasing agent, Cooper Alloy Corp., Hillside, N. J., to co-ordinate purchasing for various company divisions, including the foundry products division. For the past 15 years he was associated with Westinghouse Electric Corp., Pittsburgh.

John M. Allen was appointed personnel director, Defiance, O., plant, Central Foundry Division, General Motors Corp., Detroit. A graduate of University of Tennessee, he joined the Defiance plant in 1952.

Clifford E. Wenninger, recently associated with National Engineering Co., Chicago, was appointed technical director, Hydro-Blast Corp., Franklin Park, Ill. Active in committee work of the Sand Division, American Foundrymen's Society, Mr. Wenninger is currently chairman of the division's Basic Concepts Committee.

Allen B. Norton has retired as general manager of the castings division, Aluminum Co. of America, Pittsburgh, after 42 years of service. **Harold C. Erskine,** since 1954 assistant general manager of the division, has succeeded Mr. Norton as general manager. Mr. Norton joined the company as a chemist in Detroit after graduation from Cornell University, became assistant general superintendent of castings operations in Cleveland in 1917, and manager of the castings division in 1928. He was transferred to Pittsburgh in 1943. Mr. Erskine, a graduate of Pennsylvania State University, was previously manager of the company's Fairfield, Conn., and Cleveland operations, and assistant manager of the die casting division.

John A. Thomas, formerly assistant plant manager, was named manager of the Rushville, Ind., foundry, Perfect Circle Corp., Hagerstown, Ind. **Dallas Lunsford,** who had been acting plant manager at Rushville, has resumed his duties as the company's chief metallurgist. Mr. Thomas joined the company 20 years ago, and prior to his transfer to Rushville when the foundry was started



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Woodward takes this opportunity to thank the many foundries that have expressed appreciation to our Company for its campaign of national advertising to promote the wider use of durable cast iron products.

This campaign, which has been carried on by Woodward for the past two years, has been designed to sell architects, contractors, builders and the general public on the permanence, superior performance and long run economy of cast iron.

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S. C. MASSARI
. . . director of research

WARREN J. ZEIS
. . . joins Planet Corp.

EUGENE F. SCHLICKMAN
. . . joins NFA staff

WILLIAM I. MATTHES
. . . becomes executive v. p.

last year, he had been production superintendent of the New Castle, Ind., foundry for 4 years.

S. C. Massari, until recently manager, Foundry Division, Hansell-Elcock Co., Chicago, was appointed director of research, National Engineering Co., Chicago. Mr. Massari was technical director, American Foundrymen's Society, from 1945 to 1953, and in 1949 received the society's John H. Whiting Gold Medal for outstanding contributions to the foundry industry. He will present the Charles Edgar Hoyt Memorial Lecture at the AFS Atlantic City convention in May.

Raymond E. Thompson was elected a director and assistant to the president, Claud S. Gordon Co., Chicago. He is manager of the company's plant in Richmond, Ill.

John F. Dwyer, formerly production manager, Fansteel Metallurgical Corp., North Chicago, Ill., was appointed vice president-manufacturing, Shell Process Inc., Chicopee, Mass. He was previously associated with American Bosch Corp., Springfield, Mass.

Warren J. Zeis has joined Planet Corp., Lansing, Mich., as chief engineer of its conveyor division, succeeding **Robert E. Place** who was appointed manager of the automation section. For the past 7 years Mr. Zeis was associated with Service Conveyor Co., Detroit, until recently as chief engineer. Previously he was foundry and sales engineer, Palmer-Bee Co., Detroit.

Rex D. Cross has been appointed vice president-sales, Laclede-Christy Division, H. K. Porter Co., St. Louis.

Eugene F. Schlickman has joined the staff of National Foundry Association, Chicago, where he will direct its labor and employee relations program. Mr. Schlickman holds degrees in law and economics from Georgetown University and Loras College. Until recently he was assistant to the executive vice president, Corn Industries Research Foundation, Washington, and previously was associated with the Bureau of Labor Statistics and Bureau of Employment Security, U. S. Department of Labor, Washington.

William I. Matthes was elected executive vice president, Arwood Precision Casting Corp., Brooklyn, N. Y. He has been associated with the company for 11 years as secretary, vice president-sales, and vice president-operations.

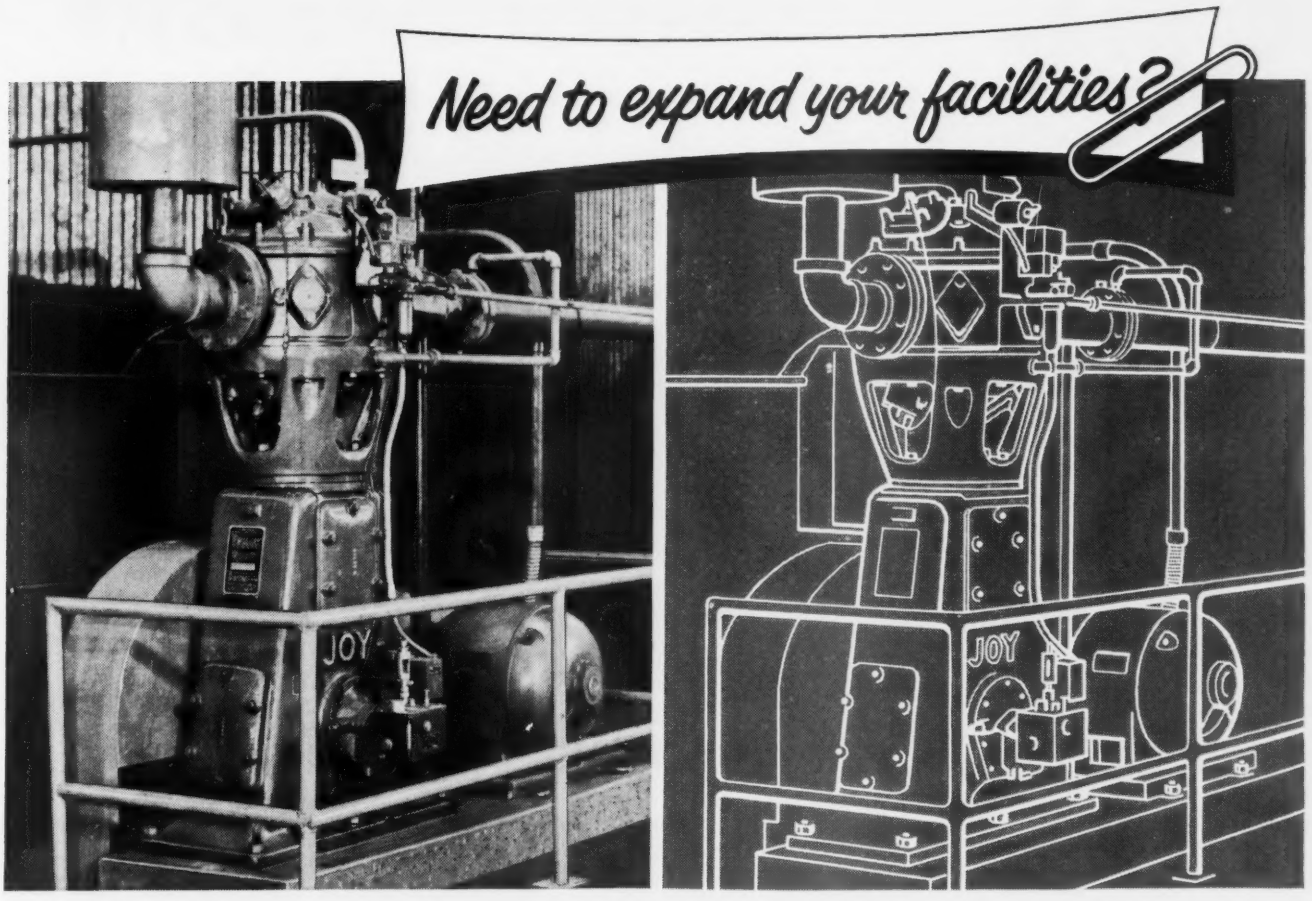
M. G. Sternberg, for reasons of health, has resigned as vice president of Blaw-Knox Co., in charge of its Continental Foundry & Machine Division, East Chicago, Ind., but will continue as a consultant. Associated with Continental for 37 years, he was president of the foundry prior to its acquisition by Blaw-Knox. **H. A. Forsberg,** a vice president of Continental Foundry, has been named manager of division plants in East Chicago, Ind., Wheeling, W. Va., and Coraopolis, Pa. **James Thomson,** for the last 25 years chief works engi-

JOHN F. DWYER
. . . joins Shell Process Inc.

JAMES THOMSON
. . . retires, Continental

H. A. FORSBERG
. . . mgr., division plants

M. G. STERNBERG
. . . retires, Continental Foundry



Add compressed air power efficiently with the JOY WG-9

The Joy WG-9 *heavy-duty* vertical air compressor is a natural for supplying additional air for an existing system, either centralized or decentralized.

Because of its smooth running characteristics and the small floor area required, the WG-9 needs only a simple, block-type foundation. The average base dimensions of a larger model WG-9, *including motor,* are 7′1″ by 4′1″. This means greater capacity per square foot of floor area—42 CFM per square foot on the 100 psi rated machines.

Thus, the WG-9 packs large compressor capacity in a small compressor area. It is possible to install the machine in a central compressor room where unused floor space is at a premium, or in a decentralized plant location where crowding of machinery is a problem.

If you have plans for a small plant, the WG-9 is designed to give you continuous 24-hour heavy-duty service. It is also widely used to meet special requirements in larger operations, such as boosting air above standard plant pressures.

The Joy WG-9 is a water-cooled compressor, available in capacity ranges up to 881 CFM piston displacement and in pressures up to 150 psi. Standard drive is multiple V-belt. This machine can be furnished for flat belt or vee flat drive if desired.

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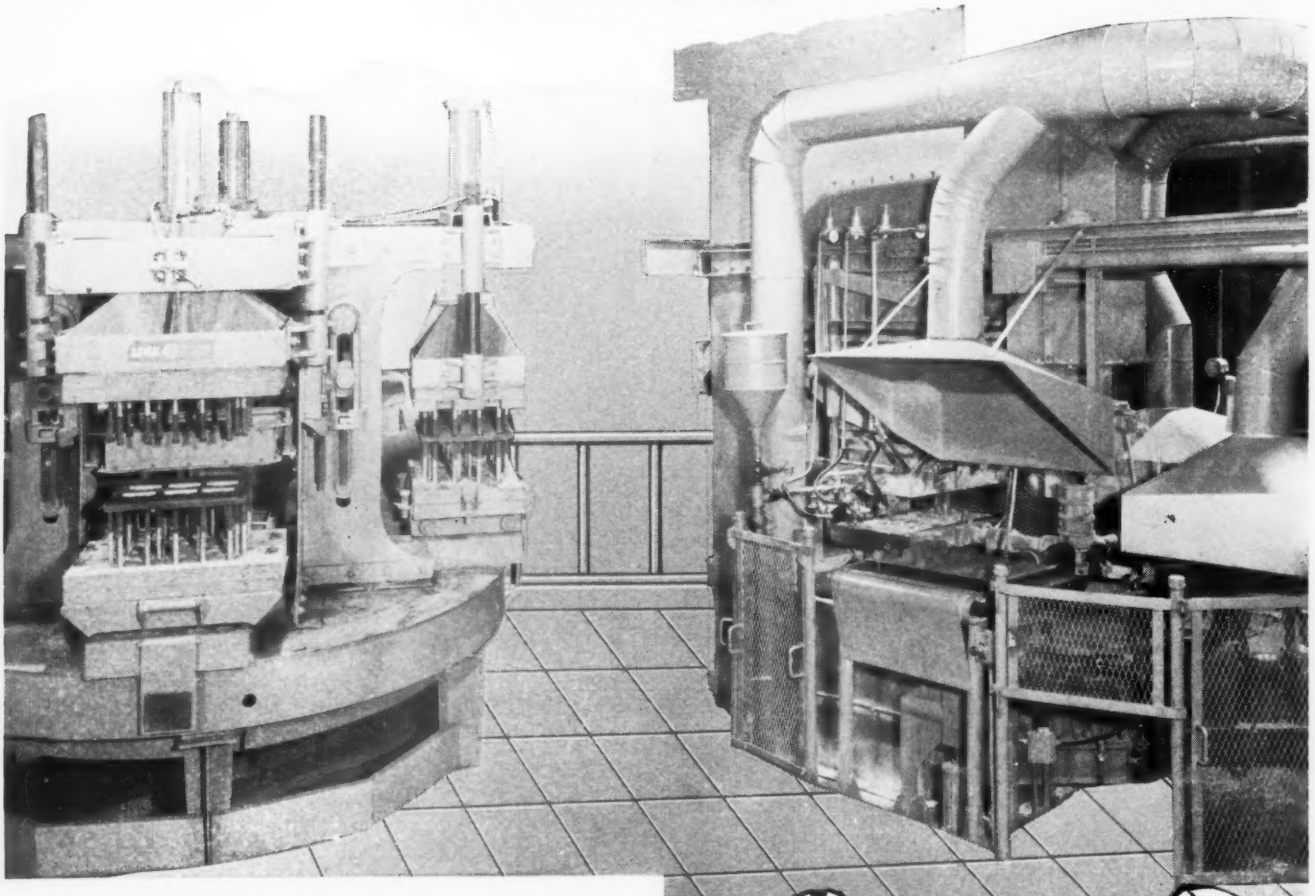
at the Foundry Show

Atlantic City May 3-9



Shell molding and closing machines, shakeout and oscillating conveyors featured at Link-Belt Booth 1434

DON'T neglect this opportunity for a close-up observation of the Link-Belt shell molding system and related equipment. Proven by actual operation to be outstanding in compactness and automatic control, the Link-Belt system is unsurpassed for high-volume production of precision castings which require little or no subsequent machining.

Book 2462 has useful information that will increase your appreciation and understanding of the shell molding method and this Link-Belt exhibit. Call your nearest Link-Belt office, or write for your copy.

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neer for Continental in East Chicago, retired recently after 39 years with the company. He is a past president of the Chicago Chapter of the AFS and a former national director.

R. T. Whitzel was named general production manager, Aluminum Co. of America, Pittsburgh, and **John D. Harper,** general manager of the smelting division, succeeding Mr. Whitzel. A graduate of Ohio State University, Mr. Whitzel joined the company in 1915. Since 1952, he has been general manager of the smelting division. Mr. Harper joined the company in 1933 and recently has been works manager of the company's new Rockdale, Tex., smelter.

Arthur P. Guidi was appointed steel foundry superintendent, Texas Foundries Inc., Lufkin, Tex., succeeding **Harlie Freeman,** resigned. **Eli Stua** was named assistant steel foundry superintendent. Mr. Guidi was associated with Texas Electric Steel Castings Co., Houston, Tex., until last December when he joined Texas Foundries as assistant to the plant manager.

Harry R. LeSage was appointed Chicago district manager, W. W. Sly Mfg. Co., Cleveland, succeeding **Allen Jones,** who has been named director of engineering. Mr. LeSage was previously engaged in conveyor and generator sales in Pennsylvania, Michigan and Illinois.

Michael C. McFadden Jr. recently joined the Central Atlantic Coast technical field section, Development and Research Division, International Nickel Co., New York, with headquarters in Abington, Pa. For the past 6 years he was with the Chevrolet-Detroit Gear and Axle Division, General Motors Corp., Detroit.

Gordon F. Simons, since 1954 works manager, Beryllium Corp., Reading, Pa., was appointed director of engineering and development. A graduate of Michigan State University, he joined the company in 1933. He previously served as assistant treasurer, production superintendent, sales manager, and technical director.

Warren R. Spofford was appointed abrasive engineer in the Syracuse, N. Y., area, for Norton Co., Worcester, Mass. **Gordon S. Brandes** has succeeded Mr. Spofford in the eastern Massachusetts territory. **Edwin A. Danielson** was appointed abrasive engineer and will cover Mr. Brandes' territory in the Rocky Mountain area. **William E. Oliver,** recently in the St. Louis office, was appointed abrasive engineer in the Grand Rapids, Mich., area. **Bruce Cramer** was appointed refractories engineer in Michigan and Indiana, succeeding **David Bolon,** resigned.

David A. Schiffer was appointed eastern manager, and **Eric Windmiller** assistant eastern manager, raw material purchases, Apex Smelting Co., Chicago. They will be in the company's Cleveland plant.

Bruce W. Markey was appointed service manager, Shallway Corp., Connellsville, Pa., the sales and service company for Shalco shell molding and blowing equipment. Mr. Markey was recently with the Aliquippa, Pa., works, Jones & Laughlin Steel Corp., and Pittsburgh Tool Steel Wire Co., Monaca, Pa.

Harold E. Collins was appointed vice president in charge of sales, Metals Disintegrating Co., Elizabeth, N. J. Since 1953 Mr. Collins has been a vice president, in charge of sales for the company's Pigments and Metal Abrasives Divisions. In his new post he will also be responsible for marketing activities of metal powders and products of the Alloys Division on the West Coast.

E. W. Prendergast, formerly Atlanta branch manager, Foxboro Co., Foxboro, Mass., has been named Southeast regional manager. **R. F. Sutton** was transferred from the Pittsburgh office to Pensacola, Fla., as industrial engineer. **H. C. Craig** was named branch manager in Jacksonville, Fla., and **L. C. Estes** was assigned to the Atlanta office. **F. J. Stevens Jr.** will work out of the Lakeland, Fla., branch. **G. W. Reed Jr.** was named New Orleans office manager and **J. K. Younkins,** manager in Charleston, W. Va. **W. H. Rhyne** was assigned to Chattanooga, Tenn.; **T. A. Jones,** to Charlotte, N. C., and **M. N. Walker,** to Knoxville, Tenn.

Donald L. Esmay and **Ronald L. Larsen** have joined the department of product research and development recently established by Lithium Corp. of America, Minneapolis. Mr. Esmay was graduated from Dakota Wesleyan University and received his doctor's degree from Iowa State College. Until recently he was with the research laboratories of Standard Oil Co.'s Whiting, Ind., refinery. Mr. Larsen, a graduate of University of Minnesota, was recently at the Uranium Division, Mallinckrodt Chemical Works, St. Louis.

Roger F. Waindle was appointed chief, Castings Branch, Iron and Steel Division, Business and Defense Services Administration, Washington. Mr. Waindle is on loan from his positions as vice president, Misco Corp., staff consultant, Consolidated Foundries &

MICHAEL C. McFADDEN JR.
. . . joins INCO technical section

BRUCE W. MARKEY
. . . Shalco service manager

HAROLD E. COLLINS
. . . becomes sa'es head

ROGER F. WAINDLE
. . . heads Castings Branch

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INDUSTRIAL BRUSHES

Mfg. Corp., Chicago, and president, Wai-Met Engineering Co., Waban, Mass. Previous associations include chief engineer, Fahralloy Co., Harvey, Ill., general manager, Alloy Engineering & Casting Co., Champaign, Ill., and vice president-director, Cannon-Muskegon Corp., Muskegon, Mich. He has been active as chairman or member of industry advisory committees to the government. Currently he is chairman, Metal Specifications Committee and a member of the Research Committee, Investment Casting Institute.

ternmaker and superintendent. **William E. McCullough** will cover the western Pennsylvania area for the company with headquarters in Pittsburgh.

J. B. Mohler recently joined Kaiser Aluminum & Chemical Corp., Oakland, Calif., as research chemist in the finishing and electrochemical applications branch of its metallurgical research department in Spokane. A graduate of Western Reserve University, he was previously research as-

R. B. Warren has been appointed sales manager, Industrial Products Division, Goodyear Tire & Rubber Co., Akron, O., succeeding **H. D. Foster,** who will retire in May after 43 years of service. **O. A. Schilling,** eastern sales manager for the division, has replaced Mr. Warren as manager of Industrial Products departments.

Robert H. Owen recently joined Electric Controller & Mfg. Co., Division of Square D Co., and will work

HENRY M. HEYN
. . . becomes division mgr.

CARROLL CONE
. . . engineering head

G. J. LANGENDERFER
. . . division sales mgr.

DONALD BEGGS
. . . manager of research

Henry M. Heyn, a vice president of Surface Combustion Corp., Toledo, O., has been appointed general manager of its Toledo Industrial Division. Other division appointments include: **Carroll Cone,** recently named chief engineer, has assumed full responsibility for all engineering activities; **Donald Beggs,** formerly assistant research director, was appointed manager of research and development, and **G. J. Langenderfer,** recently assistant sales manager, was named sales manager of the heat treat division. **W. M. Hepburn,** vice president-engineering, **C. B. Phillips,** vice president-sales, and **E. G. de Coriolis,** research director, were appointed to the president's staff.

J. C. McKenna, since 1948 manager of alkali sales, Diamond Alkali Co., Cleveland, has been appointed manager of soda products sales, a newly created post. **D. G. Hood** will continue in charge of soda ash sales to the glass industry.

Mel Conwell was appointed Midwestern sales engineer, George Sall Metals Co., Philadelphia, with headquarters in Springfield, O. For many years Mr. Conwell was associated with the foundry industry as a pat-

sistant, E. I. du Pont de Nemours Co., Wilmington, Del., head of the physical chemistry laboratory, Cleveland Graphite Bronze Co., Cleveland, and director of research, Johnson Bronze Co., New Castle, Pa. For the past several years he was a metal finishing consultant in New Castle.

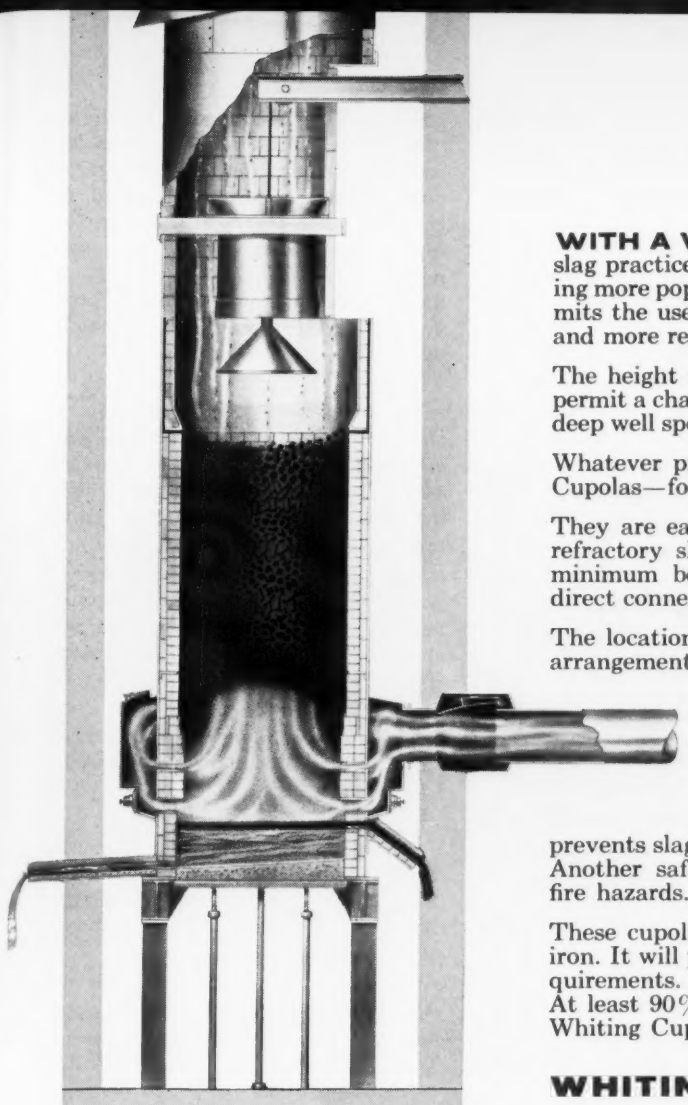
J. Harvey Johnston, vice president, General Steel Castings Corp., Granite City, Ill., was appointed a vice president of its subsidiary, National Roll & Foundry Co., Avonmore, Pa. **Roy A. Gezelius** was named assistant vice president of both companies. Mr. Johnston joined General Steel in 1942 and served as works manager at the Eddystone, Pa., plant prior to becoming vice president of General Steel in 1954. Mr. Gezelius was named metallurgical engineer at the Eddystone plant in 1939 and chief metallurgist there in 1941. He became works manager at Eddystone in 1951.

Charles T. Tinsley has been appointed assistant sales manager of the industrial rubber division Thermoid Co., Trenton, N. J. He was formerly manager of Thermoid's Southeastern division with headquarters in Atlanta.

out of the sales office in Cleveland, headquarters of the company. **Henry C. Williams** was assigned to the Philadelphia office. **N. Mark Hodapp** was transferred from Buffalo to the Cleveland office to cover the Cincinnati territory. **J. M. Hyland** was transferred from Syracuse, N. Y., to East Aurora, N. Y., to handle the Buffalo sales area.

Carl O. Hedner, since 1931 sales manager of hoisting equipment, Yale & Towne Mfg. Co., Philadelphia, was named assistant general sales manager of the Materials Handling Division. **J. Russell Manning,** formerly Cincinnati branch manager, was made Detroit branch manager for the division, succeeding **David Wirth,** who becomes national automotive account director for the company. **L. W. Goldenson** is manager of the division's San Francisco branch, replacing **Harold N. Stiles,** who was appointed acting electric truck sales manager in Philadelphia.

Hal D. Roach, formerly in the Chattanooga, Tenn., office, Laclede-Christy Co. Division, H. K. Porter Co., St. Louis, was appointed Chicago sales representative for the division. A graduate of University of Illinois, Mr.



NOW! USE BASIC OR ACID SLAG PRACTICE!

WITH A WHITING CUPOLA you can use *either* basic or acid slag practice! Basic slag practice, while still somewhat new is becoming more popular because it makes possible a reduction in sulphur, permits the use of a greater percentage of steel scrap with less pig iron and more readily increases the carbon content of the metal.

The height of the tuyeres in the Whiting Cupola may be varied to permit a change from acid to basic slag operation or vice versa. Special deep well spouts are available for use with the basic slag practice.

Whatever practice you intend to use, be sure to look into Whiting Cupolas—for they are built for a lifetime of efficient service.

They are easy to erect and the design permits the use of standard refractory shapes from top to bottom. Piping costs are held to a minimum because the tangential blast entrance allows the most direct connection from blower to windbox.

The location of windbox above the tuyeres allows for easy light-up arrangements. Air for melting is distributed evenly with minimum resistance—with no air leakage in windbox. Lining and stack are protected against moisture by stack joints that open downward.

A fusible safety plug is provided with a special safety tuyere. If the cupola tender does not tap quickly enough, the metal and slag flow through a channel which prevents slag from entering other tuyeres and will warn the operator. Another safety feature is a double-cone spark arrester to reduce fire hazards.

These cupola principles result in economy and high quality molten iron. It will pay you to call in a Whiting Engineer to discuss your requirements. He has the *experience* to help you plan your installation. At least 90% of the cast iron that is melted in cupolas is melted in Whiting Cupolas! Write or phone for his counsel now!

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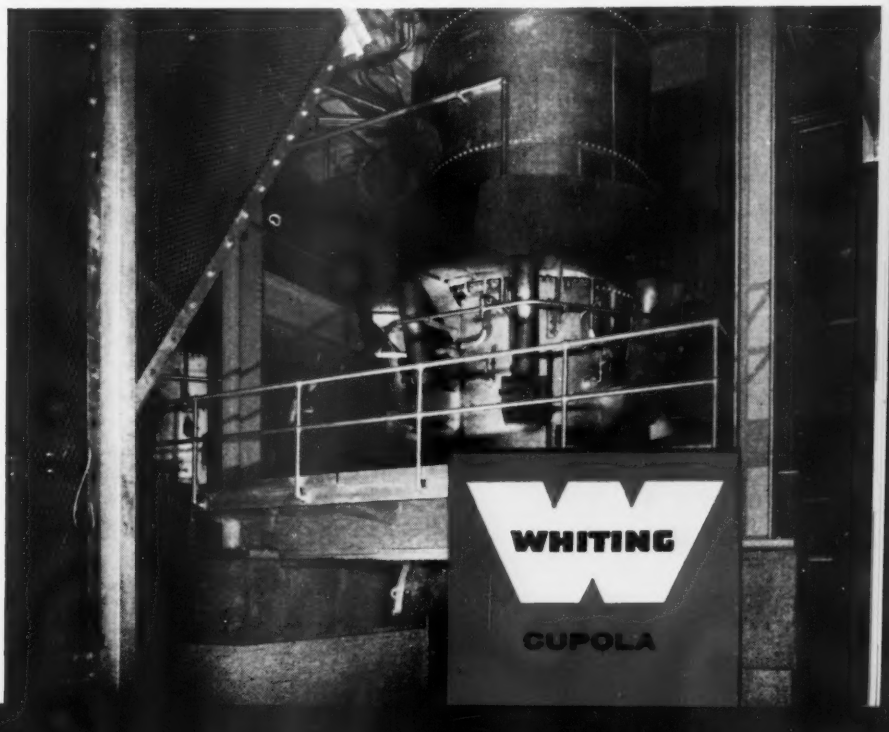

Roach joined the company in 1948. He was elected secretary of the Tennessee Chapter of the AFS for the current year.

Horace M. Bringhurst has been named president-general manager, Superflux Mfg. Co., Allen Park, Mich., formerly Weaver Block Co., Detroit. Mr. Bringhurst retired recently as director of foundry coke sales in Detroit, for Semet-Solvay Division, Allied Chemical & Dye Corp., New York. A graduate of University of Michigan, he joined Semet-Solvay Division in 1933. In 1951 Mr. Bringhurst was appointed assistant director of the Coke Division, Defense Solid Fuels Administration, Washington, and was named director in 1953.

J. P. Stine was appointed East Coast zone manager, Thor Power Tool Co., Aurora, Ill., covering New York, Boston, Buffalo and Newark, N. J., with headquarters in Newark. **C. B. Baron** was named West Coast zone manager for Los Angeles, San Francisco and Seattle territories, with headquarters in Los Angeles. **R. J. Burch** was appointed Southeastern zone manager in Mississippi, Tennessee, Alabama, North and South Carolina, Georgia, Florida and part of Louisiana, with headquarters in Birmingham.

T. D. Owens was appointed manager, foundry coke and pig iron sales, and **W. J. Patterson,** manager, industrial coke and chemical sales, Alan Wood Steel Co., Conshohocken, Pa.

Ralph E. Zimmerman was appointed district representative, Frank G. Hough Co., Libertyville, Ill., in New York and Pennsylvania, excluding New York city and Philadelphia. His headquarters will be in East Syracuse, N. Y.

Milo L. Phillips was appointed sales engineer and technical consultant, Alloys & Chemicals Mfg. Co., Cleveland. A graduate of University of Minnesota, Mr. Phillips was previously associated with Aluminum Co. of America, Pittsburgh, and William F. Jobbins Co., Aurora, Ill.

Robert J. Yochum, St. Louis, recently joined Bay State Abrasive Products Co., Westboro, Mass., as

ROBERT J. YOCHUM
. . . Bay State Abrasive sales

abrasive engineer. A graduate of the School of Mines, University of Missouri, for the past 6 years he was with St. Louis Shipbuilding & Steel Co., St. Louis.

H. Edward Ehlers Jr. and **Warren A. Zimmer** were elected vice presidents, Joseph Dixon Crucible Co., Jersey City, N. J. With the company since 1935, Mr. Ehlers was general sales manager for the past year. Mr. Zimmer, since 1951 works manager, joined Dixon Crucible in 1936. **R. C. Brock** has succeeded Mr. Ehlers as general sales manager, after a year as industrial sales manager. **David C. McMillin** was appointed assistant general sales manager, in Jersey City. **A. G. Fletcher** has been appointed Western district manager, a position Mr. McMillin has held for the past year. **Harry I. Goecker,** formerly purchasing agent, has been named director of purchases. **E. M. Strom** was appointed assistant product manager, graphite and lubricants division.

L. M. Diran was appointed in charge of cast constructional steel developments, Development and Research Division, International Nickel Co., New York. Mr. Diran joined the ferrous casting section of the company's research laboratory in Bayonne, N. J., in 1954. Previously he was a research associate at Massachusetts Institute of Technology, where he received the degrees of doctor and master of science. For 5 years he was foundry metallurgist, Lebanon Steel Foundry Co., Lebanon, Pa.

Peter V. Schwab was appointed Pittsburgh district manager, Naresco Equipment Corp., sales subsidiary of National Research Corp., Newton Highlands, Mass.

Deane Courtright was appointed district sales representative, Leschen Wire Rope Division, H. K. Porter Co., St. Louis, to cover Washington, Idaho, and Montana.

L. L. Duncan, director of advertising and sales promotion, D. J. Murray Mfg. Co., Wausau, Wis., was also appointed sales manager of the Unit Heater & Mill Supply Division.

David G. Matthews was appointed assistant sales manager, Wilton Tool Mfg. Co., Schiller Park, Ill. **Albert Burke** was named sales engineer for the company in upstate New York.

RALPH E. ZIMMERMAN
. . . Frank G. Hough sales

H. EDWARD EHLERS JR.
. . . Dixon Crucible Co. v. p.

DAVID C. McMILLIN
. . . assistant gen. sales mgr.

R. C. BROCK
. . . general sales mgr.

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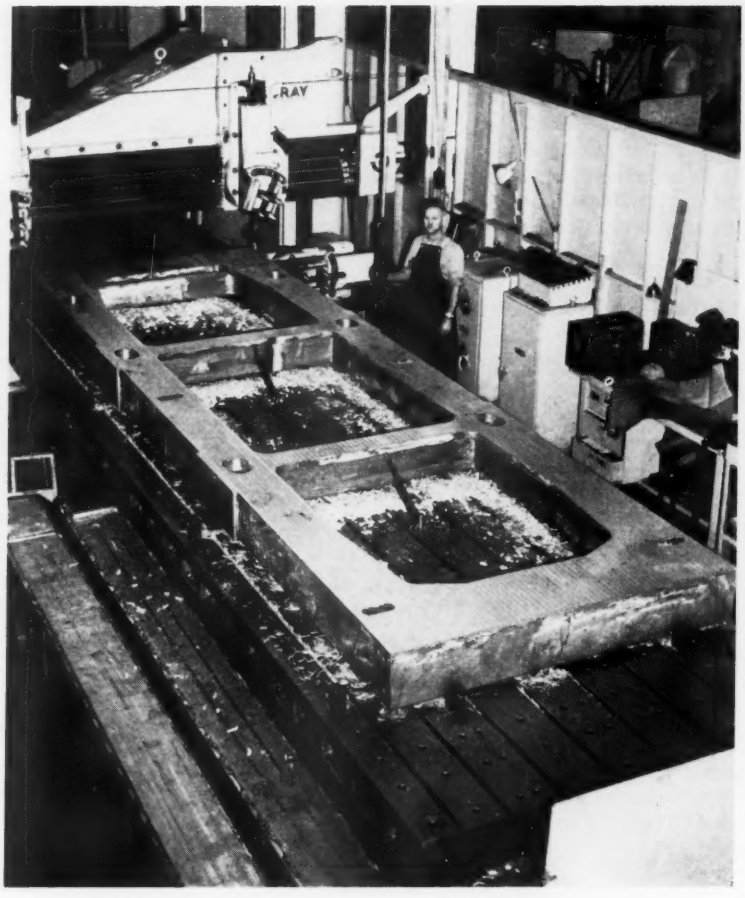
Big Aluminum Castings

—Lower Tooling Costs

By THOMAS A. DICKINSON



Finishing one of the end-gate castings used to replace weldments in wing jigs at Boeing Airplane Co., Seattle

BY MAKING some of the largest aluminum castings they had ever produced, foundrymen at Boeing Airplane Co., Seattle, recently saved more than $3000 in the construction of wing jigs for the manufacture of KC-135 Jet Stratotanker aircraft.

The castings were used as end gates—which, in addition to permitting the accurate alignment of wing components as the latter are assembled, must swing open if a finished wing assembly is to be removed from its jig. Each casting weighed 5400 lb, had a height of 14 ft, a width of 5 ft and a thickness of 1 ft.

Boeing previously made end gates for wing jigs by welding prefabricated aluminum parts. This was a comparatively expensive procedure because the parts could not be fabricated and welded as rapidly as complete gates could be cast and finished. In addition, the welded components had a tendency to "crawl" or distort due to differences in thermal coefficients of weld and parent metals. This condition often made it difficult to assemble close-tolerance parts.

Despite the advantages that were to be gained by the use of castings, the decision to cast end gates was somewhat daring because Boeing's foundry had not previously made nonferrous castings with such large dimensions.

Aluminum was selected as the casting metal because its thermal expansion coefficient was essential to the maintenance of close dimensional tolerances in the assembly of KC-135 wings. Since it was also possible to use considerable scrap in making the castings, this accounts for some of the savings that were realized.

A pattern for the end gates was made in a conventional manner from wood, after which molds were fabricated by pneumatically ramming No. 1 Albany sand over the pattern in a specially-made fir plywood flask.

The initial casting was satisfactorily made by pouring molten aluminum from 1800-lb-capacity ladles. The mold's gating and risering was such that about 2700 lb of metal was removed from the casting in finishing it.

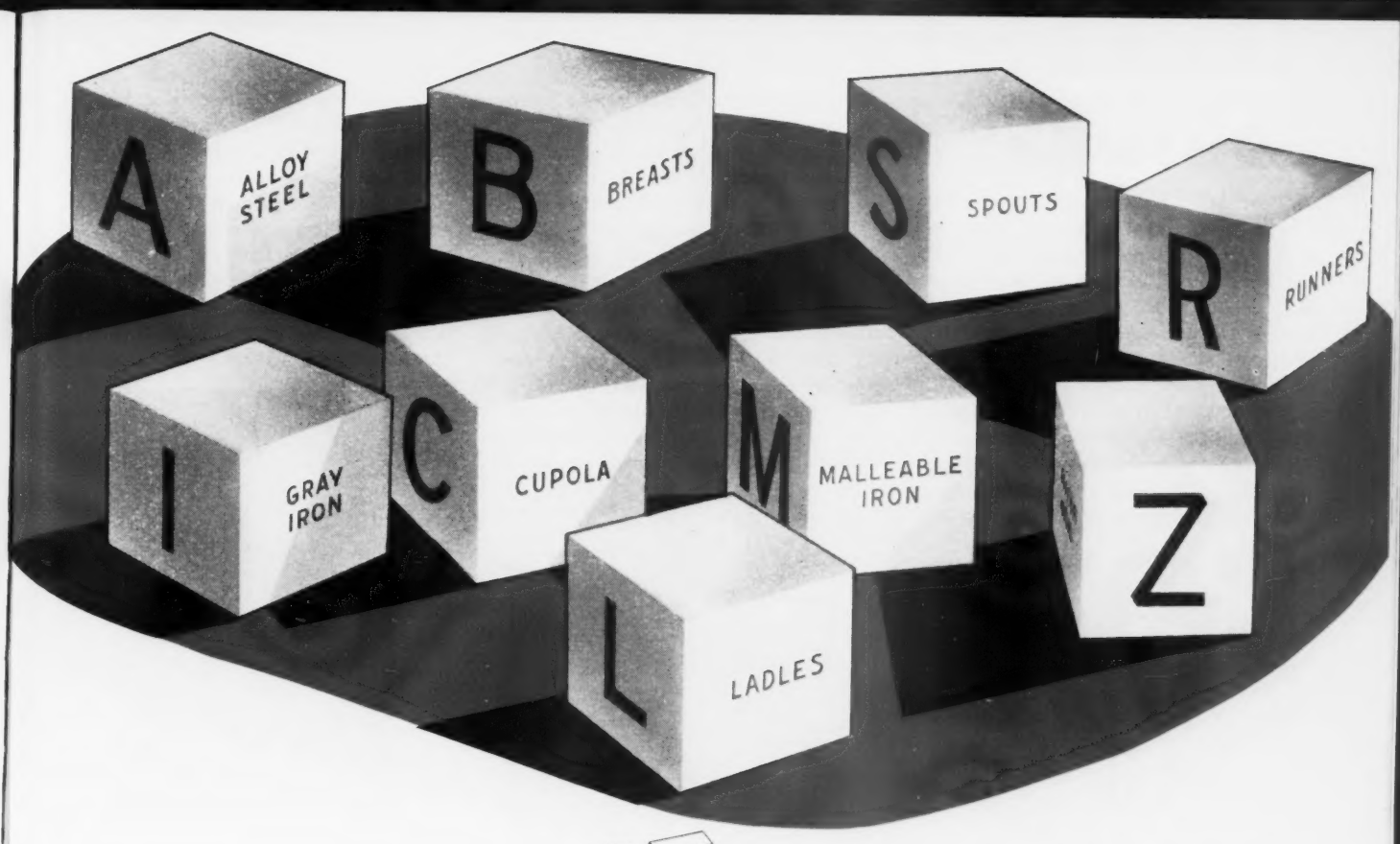
Because experience made it seem obvious that the risers were excessive, the dimensions subsequently were reduced until only 8 per cent of the as-cast weight was eliminated in finishing and machining. For example, risers which were originally 12 in. in diameter and 24 in. deep were reduced to 4-in. diameter and 12-in. depth.

Such a drastic reduction in size was made possible partly by using a moldable exothermic feeding compound in the risers. This type of liner helps to delay solidification of riser metal while it is feeding the casting.

In casting only two end gates, Boeing has spent $11,509 for tooling components that would have cost $14,600 if made with welding equipment. And experience has shown that castings have nothing even remotely comparable to weldments' tendencies to "crawl."

As a result of all this, tooling men have been finding an unprecedented variety of uses for company foundry facilities during recent months. To date, they haven't specified the casting of parts which are larger than these gates. But they've called for several that come close.

For instance, there's a 17 x 7 ft expansion beam with an as-cast weight of 5100 lb. It's also being used in the construction of KC-135 wing jigs.



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HELSPOT has a wide field of use in the foundry. Any application in the grey-iron, malleable iron, or steel foundry and non-ferrous shop, wherein the refractory is covered with molten metal or slag, affords an excellent place to employ HELSPOT.

HELSPOT is recommended particularly for lining ladles (pouring, holding, transfer, shank etc.) and spouts of melting units. The "No-Slag" feature of HELSPOT makes it a "Must" for today's spout lining.

HELSPOT is also recommended for use in steel foundries where temperatures encountered are high, and where ordinary linings are short-lived due to inability to counter the unusually corrosive slag.

HELSPOT is furnished in plastic form, sliced, in 100-lb. cartons. HELSPOT Dry is furnished in 100-lb. bags for mixing on the job. HELSPOT Ladle Wash, in 100-lb. bags, is recommended for washing all types of ladle linings.

You are invited to meet "MR. HELSPOT" in Booth 1313 at the A.F.S. Convention in Atlantic City, May 3 thru May 9.

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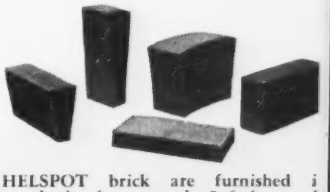
The HELSPOT products are exclusive developments of the Mexico Refractories Company. Services of its engineering department are available to you for special applications.

HELSPOT plastic is packed in 100-lb. waterproof cartons, already sliced for ease of handling.

HELSPOT dry is available for those who prefer a dry material, to be mixed on the job. Shipped in 100-lb. bags.

HELSKOTE ladle wash is shipped in 100-lb. bags, dry, ready for mixing. For spray or brush application.



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West Steel, 50 Years Old, Establishes Alloy Division

West Steel Casting Co., Cleveland, marking its 50th year in business this year, is establishing an Alloy Division in facilities just purchased at 1679 Collamer Rd., East Cleveland, it has been announced by Ralph R. West, president. Operations were expected to start late in March.

The new facilities formerly housed the Standard Alloy Co., which vacated them last summer.

Paul G. Lutz, formerly vice president and general manager of Standard Alloy Co., with which he had been associated more than 15 years, will be general manager of the new division. Works manager will be L. W. Anderson, who has had more than 25 years' experience in the alloy field. His previous connections included Pioneer Alloy, Standard Alloy and National Alloy companies. Most recently he was with the Michigan-Standard Alloy Casting Co., Detroit.

The division will operate as a jobbing foundry, producing all commercial alloys specified by the Allied Casting Institute and the American Iron and Steel Institute. Melting equipment will include both electric arc and induction furnaces.

West Steel Casting Co. was founded in 1906 by Ralph H. West, father of the current president, at the site it still occupies at 805 East 70th St., Cleveland. In addition to Ralph R.,

PAUL G. LUTZ

two other sons of the founder are associated with the company. Thomas D. West is vice president in charge of operations and Samuel B. is vice president, secretary and chief engineer. C. E. Marcum is controller and R. G. Ullman is vice president, sales.

The company's original plant, measuring 120 x 160 ft, has been expanded over the years to 160 x 700 ft. Nearby storage facilities occupy 150 x 400 ft. Production includes carbon and low-alloy steel castings. The foundry normally employs 250 to 300.

Spanish Foundrymen Visit U.S.

Six Spanish foundry executives recently concluded a tour of foundry operations in this country under the sponsorship of the International Cooperation Administration. They observed plants in Bridgeport, Conn., Bayonne and Milleville, N. J., Philadelphia, Pittsburgh, Cleveland, Detroit, Chicago, Waukegan, Ill., and Syracuse, N. Y. The tour is part of the technical exchange program, and new ideas in production and management were stressed.

The group will make a report of its findings to be circulated in the foundry industry and in industry at large in Spain. Its members also will sponsor the organization of special courses in foundry practices at Spanish productivity centers.

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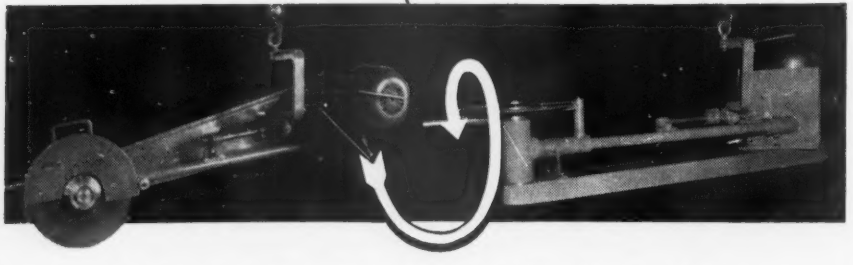

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Dry bond	Kordek	Dextrine	Mogul
Green sand	Mogul	Dextrine	—
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Collapsibility	Dextrine	Kordek	Mogul
Scratch hardness	Dextrine	Kordek	—
Reduced baking time	Mogul	Kordek	Dextrine
Better blowing	Mogul	—	—
Easy ramming	Mogul	—	—
Simplified, cleaner mixing	Kordek	Dextrine	Mogul
Easy shake-out	Mogul	Kordek	Dextrine
Smoother casting finish	Mogul	Kordek	Dextrine
Dry, easily handled	Mogul	Kordek	Dextrine
Less waste in handling	Mogul	Kordek	Dextrine
Better core paste	Kordek	—	—
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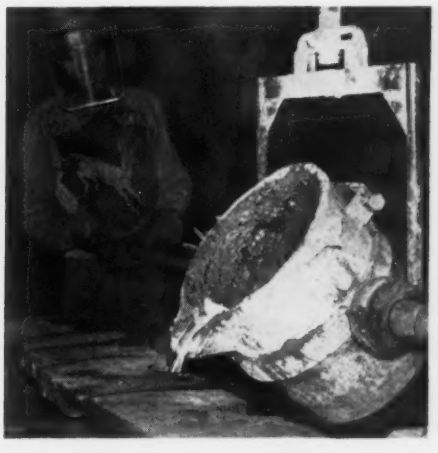

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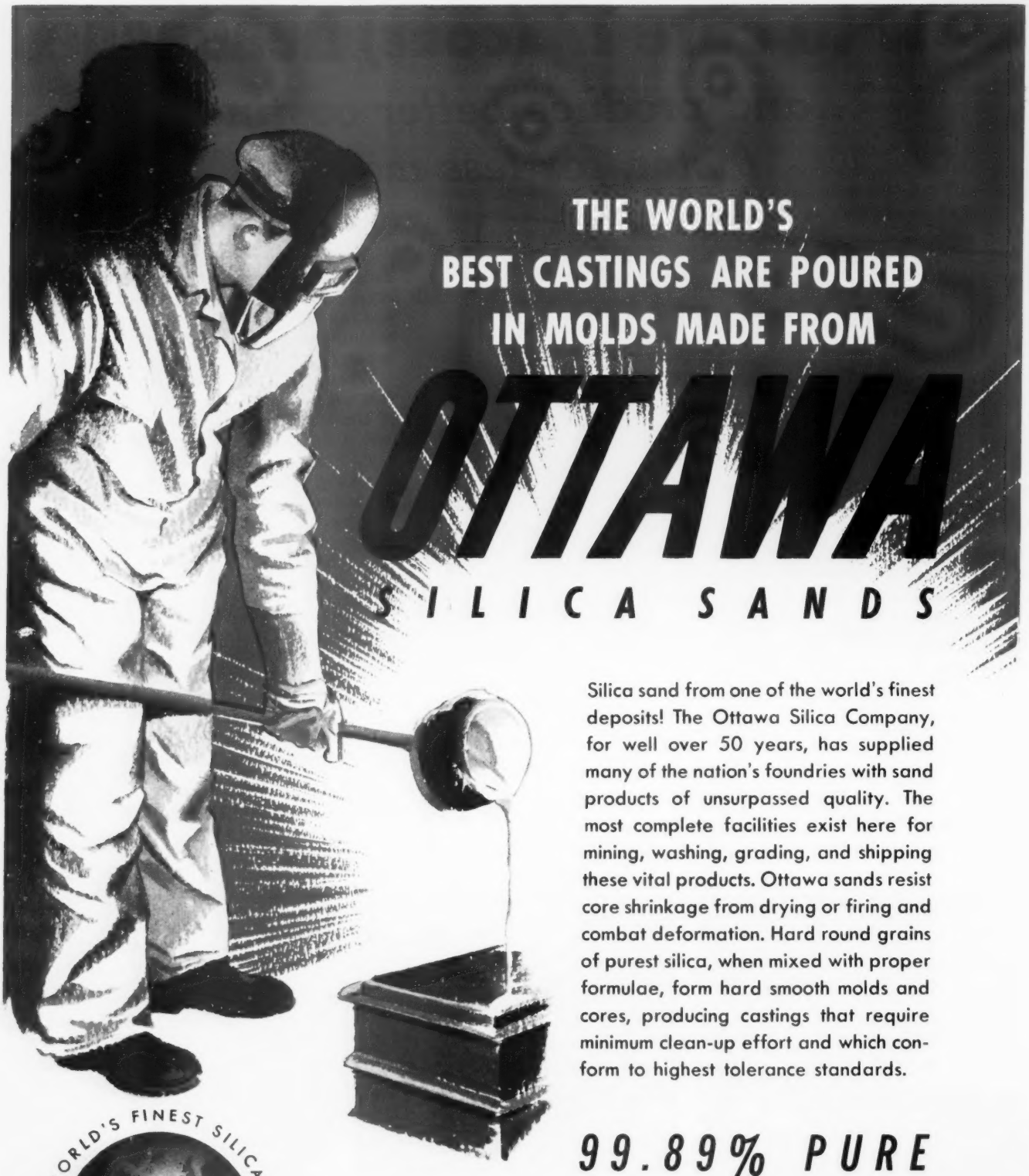

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Among the conference speakers were, left to right: Ray Olson, Shell Process Inc.; Tom Barlow, Eastern Clay Products Dept.; Roy Carver, Carver Foundry Products Co.; Earl Woodliff, Foundry Sand Engineering Co., and A. Lesley Gardner, Pangborn Corp.

Foundrymen Meet in Birmingham for

SOUTHEASTERN CONFERENCE

By WILLIAM G. GUDE
Managing Editor

TWENTY-FOURTH of the series of successful Southeastern Regional Foundry Conferences was held in Birmingham, Feb. 16-17. As in recent years, the conference was sponsored by the Birmingham District, Tennessee and University of Alabama student chapters of the American Foundrymen's Society. Attendance was about 400.

The program of ten technical papers included discussions of some of the relatively new foundry practices—CO_2 process, shell coremaking and high-pressure molding—as well as of more conventional subjects. Friday morning was devoted to visits to local plants.

Jobbing with Shell Cores and Molds, discussed by Ray Olson, Shell Process Inc., Chicopee, Mass., opened the technical program. Advantages of such cores lie primarily in their smooth surface, accurate dimensions, collapsibility, economy of production and permeability. Coreboxes used must not only be accurate but also be able to withstand repeated heating to 500° F. It is possible to make large hollow cores sufficiently strong by the use of inserts in the corebox which will produce internal ribs in the core. Maximum amount of resin required for a coated sand for coremaking is about 2 per cent.

Job Evaluation, by Milton E. Annich, American Brake Shoe Co., Mahwah, N. J., was a detailed description of various systems used to determine the relative importance of job classifications in a plant. These results provide a sound basis for pay rate differentials. If basic principles are followed, any foundry can set up its own job evaluation plan. It is best to start with the so-called point system, then change to the factor comparison method three to five years later. Before attempting to

Left to right: W. B. Greiser, Tennessee Chapter chairman; Rev. Harold C. Martin; A. J. Fruchtl, Birmingham Chapter chairman; Bruce Simpson, president of the AFS; J. F. Drenning, Birmingham Chapter vice chairman

Bruce Simpson, left, and William W. Maloney hold banner presented the Birmingham Chapter for its successful drive to increase membership. A similar banner was awarded the Tennessee Chapter for membership gains

set up any system, it is desirable to prepare specifications and a description of each job.

Selection and Preparation of Sands for Foundry Use, by Earl E. Woodliff, Foundry Sand Engineering Co., Detroit, pointed up the fact that acceptance of sand control by the foundry industry is the most important development in sand practice since the war. Control actually is a matter of exercising good sense, but the one responsible for it must be familar with the effect of mechanical processing on the sand's behavior. Many casting defects result from sand expansion and it is necessary to provide the clay, and possibly certain additives, that will act as a cushion between grains. While we have only begun to scratch the surface in the science of sand use, the tendency to follow accepted practices often retards new developments.

High-Presure Molding, by Tom Barlow, Eastern Clay Products Department, International Minerals and Chemical Corp., Chicago, described developments in sand and equipment to produce close-tolerance castings in firm sand molds. This subject was treated in detail by the speaker in an article in March FOUNDRY, p. 104.

Carbon Dioxide Mold and Core Hardening was both a discussion and actual demonstration of the process by Roy Carver, Carver Foundry Products Co., Muscatine, Iowa. High and low temperature extremes in the sand used should be avoided, as also should excessive mixing time of binder and sand. To avoid penetration, 80-90 fineness sand is preferred, unless a wash is used. Addition of 2 per cent iron oxide permits use of a relatively coarse sand having good collapsibility.

Foundry Refractories, by L. L. Gill, Harbison-Walker Refractories Co., Pittsburgh, consisted of a description of the usual types of refractories for gray iron, malleable iron and steelmaking melting furnaces, plus a discussion of special refractory materials.

Aluminum Foundry Practice and Casting Defect Correction, by D. L. LaVelle, Federated Metals Division, American Smelting & Refining Co., Barber, N. J., listed various casting defects and their causes. These included such problems as inclusions caused by aluminum oxide, brittleness resulting from iron pickup, porosity from hydrogen gas entrapment, shrinkage resulting from inadequate gating, and poor pouring practice resulting from carelessness.

Modernizing the Cleaning Room, by A. Lesley Gardner, Pangborn Corp., Hagerstown, Md., traced the development of airless blast cleaning and a description of barrel, table and room type units. Importance of preventive maintenance of the equipment and of keeping the abrasive clean was stressed; also the necessity of using the right kind of abrasive for each job.

The Injection Process in the Foundry, by G. P. Dahm, Linde Air Products Co., described the injection of calcium carbide into molten iron to reduce sulphur content and improve physical properties of the metal. The process is said to offer production economies, better production control and cleaner finished products, and is particularly useful to foundries producing nodular iron.

How the Melting of Brasses and Bronzes Affects the Quality of Castings, by William Ball Jr., R. Lavin & Sons Inc., Cincinnati, emphasized that the type of alloy, type of melting furnace and production required all affect casting quality. Other important considerations are the furnace atmosphere, melting department supervision and pouring temperature.

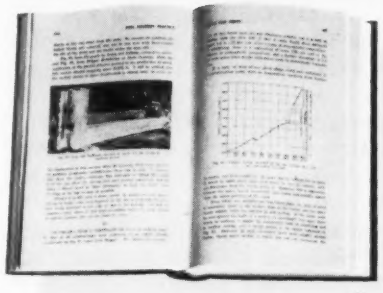
A luncheon meeting on Thursday, presided over by the Birmingham District Chapter vice chairman, John F. Drenning, Kerschner, Marshall & Co., was addressed by top AFS officials—Bruce L. Simpson, national president; Frank W. Shipley, national vice president, and William W. Maloney, general manager. Activi-

Group at the annual conference banquet. Standing, left to right: Bruce Simpson; Tom Sims, toastmaster; E. E. Pollard, past chairman, Birmingham. Seated: John W. Pendleton, University of Alabama; A. J. Fruchtl

NEW — Just Published!

STEEL FOUNDRY PRACTICE

By JOHN HOWE HALL



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Steel Foundry Practice contains practical information on almost every production problem steel foundrymen encounter. The easy-to-read text is accompanied by over 250 detailed charts, drawings and illustrations of the "how-to-do-it" type.

This volume represents the last of the many contributions which the late John Howe Hall made to the progress of the foundry industry. Material presented in this book began as a series of articles in FOUNDRY magazine.

Steel foundry personnel (from top executives to apprentices), educational institutions, technical libraries, suppliers to the steel foundry industry . . . all will benefit from the use of this book.

A complete cross index permits ready reference to any section. Many references relating to additional sources of information are provided. Use the coupon at the bottom of this page to order your copies now.

ABOUT THE AUTHOR

The late John Howe Hall was associated with the production of steel castings for nearly 50 years. Mr. Hall received his bachelor's and master's degrees from Harvard University. He was employed by Bethlehem Steel Co. and Buffalo Crucible Castings Co. until 1906, when he joined Taylor-Wharton Iron & Steel Co. He remained there until 1937, when he became a consulting metallurgist. His previous major work was The Steel Foundry, *published in 1914, with a second edition in 1922.*

Mr. Hall was the author of many papers presented before the American Society for Testing Materials, the American Foundrymen's Society, the American Institute of Mining and Metallurgical Engineers and the American Society of Mechanical Engineers. In 1924, he received the first Whiting Medal awarded by the AFS.

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ties of the national organization and plans for the coming Atlantic City convention were discussed. Mr. Simpson presented awards in the form of banners to the Birmingham and Tennessee chapters for their success in increasing their memberships.

The annual banquet concluding the conference had Birmingham Chapter Chairman Albert J. Fruchtl, W. Thomas Barr Associates, presiding, with John W. Pendleton, University of Alabama, speaking on "Outlook for Education."

Michigan Regional Conference Is Planned for Nov. 29-30

Annual AFS Michigan Regional Foundry Conference will be held at the Union Building, University of Michigan, Ann Arbor, Mich., on Nov. 29-30. Sponsors are the Central Michigan, Detroit, Saginaw Valley and Western Michigan chapters of the AFS in conjunction with the student chapters at Michigan and Michigan State universities.

Conference chairman is Robert D. Dodge, Archer-Daniels-Midland Co., Detroit. Other committee chairmen are: Program, Richard B. Kropf, International Nickel Co., Detroit; publicity, Ray Sutter, Sutter Products Co., Detroit; banquet, Gerald Strong, Battle Creek Foundry Co., Battle Creek, Mich.; reception and arrangements, Ray Reiff, Ford Motor Co., Dearborn, Mich., and student activity, Charles E. Drury, General Motors Corp., Saginaw, Mich.

Mr. Kropf also is serving as vice chairman of the conference; Prof. Richard A. Flinn, University of Michigan, secretary; Prof. Wayne Kraft, University of Michigan, treasurer, and Jess Toth, Harry W. Dietert Co., Detroit, executive secretary-treasurer.

Plans Safety Campaign

National Safety Council plans an intensive nationwide campaign to reduce accidental falls by focusing attention of management and workers on this type of accident. Most falls result from unsafe acts of individuals and a little extra caution and knowledge on the part of each person can do much toward reduction of accidental falls. Among the materials designed to arouse the worker's enthusiasm for protecting himself will be booklets, films, banners, posters, 5-minute safety talks and safety instruction cards. For sample booklet and list of materials and prices, write the National Safety Council, 425 North Michigan Ave., Chicago 11.

DOLOMITE as a FLUX in Steelmaking

By SHEN KOU-WEN
Amomo, Tsc, Tai-nan
Formosa, China

FORMOSA is situated in a subtropical zone where the humidity is high. The lime commonly used in production of steel often contains moisture as high as 14.3 per cent by weight. This figure is well above the maximum water content of 0.5 per cent recommended by many foundrymen. Consequently, if the lime containing high moisture is not preheated before use, the resulting steel castings and ingots are usually poor in quality because of the blowholes and other defects caused by high hydrogen content in the metal.

The writer has found a solution to this problem by using calcined dolomite instead of lime as a flux in steelmaking. Dolomite is an important basic flux. The local calcined dolomite contains 27-32 per cent CaO and 20-25 per cent MgO. The magnesia of dolomite reacts at high temperature with Al_2O_3, Fe_2O_3, and SiO_2 to form $MgO \cdot Al_2O_3$, $MgO \cdot Fe_2O_3$, and $MgO \cdot SiO_2$. It also reacts with certain bath impurities which lime may not affect.

The available base of calcined dolomite is equal to that of lime and will not affect the V-ratio of slag in steelmaking. According to some specialists, magnesia can lower the viscosity and increase the fluidity of slag, thus the dolomite can help the full functioning of flux and produce steel of better quality.

Dolomite used as a flux in basic steelmaking is the same material employed as the furnace refractory. Corrosion caused by slag and metal bath will decrease when dolomite is used as the flux and indirectly extend the life of furnace refractories. Calcined dolomite does not absorb the moisture as easily as the lime does.

To determine the effect of substituting dolomite for lime, the writer melted steel scrap in a 1-ton direct-arc, nonconductive bottom furnace and back-charged the furnace three times to obtain a total melt of 1.5 tons. In making low-carbon steel, SAE 1012, the process followed was the same as that for lime flux steelmaking except sufficient crushed coke and hot rolling mill scale were charged with the scrap and 175 kg (385 lb) calcined dolomite was substituted for the lime. The heat required about 3 hours and 45 minutes and consumed about 709 kwh of electricity per ton.

Test results showed the exterior and interior of the castings free from blow-holes and shrinkage holes. Chemical analysis conformed to the SAE 1012 specification, containing 0.12 per cent C, 0.53 per cent Mn, 0.019 per cent P, and 0.041 per cent S.

Mechanical properties were:

	Tensile Strength, psi	Elongation, %	Reduction of Area, %
As cast	54,475	38	43.75
Full annealed	54,475	54	57.75

Grain Size of Steel—According to the usual method of estimating carbon content of steel by examination of a fracture specimen, that of steel made by using dolomite flux appears to contain less carbon content than steel made by using lime flux. Therefore, the grain size of steel made with dolomite is finer than steel made with lime flux.

Mechanical Properties — Both elongation and reduction of area test results indicate that use of dolomite flux in basic steelmaking produces steel with high toughness.

Economy — Dolomite is abundant and can be obtained at reasonable price in Formosa. The writer, in using dolomite, also finds that manganese recovery is 0.15-0.20 per cent higher than when lime flux is used in basic steelmaking.

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FOUNDRYMEN AND EDUCATORS MEET

In Annual FEF College-Industry Conference

ANNUAL College-Industry Conference sponsored by the Foundry Educational Foundation attracted about 200 educators and foundrymen to Cleveland, Mar. 7-8, for the ninth and best attended of such meetings. Principal discussion subjects were the reports of different FEF schools on their educational activities and the role of the engineer in the foundry industry, particularly in smaller shops.

At the annual meeting of the foundation held during the conference, James H. Smith, Central Foundry Division, General Motors Corp., Saginaw, Mich., was chosen president to succeed Edward C. Hoenicke. Mr. Smith was vice president during the past year.

Other officers elected are: Vice president, C. V. Nass, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago; secretary-treasurer, E. M. Knapp, Ferro Machine & Foundry Inc., Cleveland; executive director, E. J. Walsh, Cleveland.

Newly elected trustees are: C. W. McLennan, Lynchburg Foundry Co., Lynchburg, Va.; Cal C. Chambers, Texas Foundries Inc., Lufkin, Tex.; H. C. Erskine, Aluminum Co. of America, Pittsburgh; W. W. Heimberger, Buckeye Steel Castings Co., Columbus, O., and F. G. Steinebach, FOUNDRY, Cleveland.

Trustees named to represent the various founding members of FEF include: Malleable Founders' Society, C. E. Brust, Eastern Malleable Iron Co., Naugatuck, Conn.; Gray Iron Founders' Society, E. L. Roth, Motor Castings Co., West Allis, Wis.; American Foundrymen's Society, O. J. Myers, Archer-Daniels-Midland Co., Minneapolis, Minn.; Foundry Equipment Manufacturers Association, W. B. Wallis, Pittsburgh Lectromelt Furnace Corp., Pittsburgh; Non-Ferrous Founders' Society, E. J. Metzger, Multi-Cast Corp., Wauseon, O.; Steel Founders' Society of America, M. J. Allen, American Steel Foundries, Chicago.

Mr. Smith presided at the opening conference session. An address of welcome by President Hoenicke preceded the first of six talks by school faculty representatives. Warren C. Jeffery, associate professor, University of Alabama, pointed out that the

JAMES H. SMITH
President, FEF

FEF was far-sighted in recognizing in advance of industry the need for an increased number of engineers among foundries. He related how three foundries made use of graduate engineers, with resulting benefits in the forms of increased productivity, higher casting yield from improved gating and risering and in product development work.

How the student and graduate of a co-operative type of school fits into foundry work in the medium-size plant was discussed by W. H. Tholke, instructor, and Fred Westermann, assistant professor, University of Cincinnati. At this school, students alternate periods of classroom and industrial work. Students taking up foundry work start in the labor pool as helpers in various departments. Job responsibilities are increased in subsequent years as they return to the foundry, so that upon graduation the individual has the equivalent of a two-year practical training period. This experience cuts the training time necessary when he enters full-time employment.

Since only the larger foundries can afford to employ engineers in their various departments, smaller shops must combine these activities under the responsibility of one man. Mr. Westermann listed the requirements of the foundry engineer as 1) adequate technical and scientific background, 2) the ability to apply this knowledge and 3) the faculty of getting along with people.

M. S. Burton, associate professor, Cornell University, explained how foundry facilities at the school are used in teaching other metallurgical subjects; he added that students in various courses hear considerable about cast metals. He illustrated how the solidification of steel is demonstrated through use of carbon tetrabromide instead of molten metal.

R. A. Flinn, professor of metallurgical engineering, University of Michigan, Ann Arbor, Mich., discussed the "Role of the Development Engineer" and strongly emphasized that to attract engineers into the foundry industry the role must be right and the employment approach must be such that the engineer will be attracted and sold upon his future with the company. Foundries both small and large are aware that engineers make excellent managers but the small foundry doesn't realize that development work is essential to progress and survival. Small foundries can meet the challenge of future competition if they will take advantage

Conference banquet was addressed by Dr. Deane W. Malott, president, Cornell University

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IT'S the job of the "Blastmaster" to clean heavy castings and forgings by tumbling them in a high-velocity stream of abrasive. Of course, it's important that the flying abrasive be sealed in the barrel. The answer: mount the drum head trunnions on Timken® bearings. Their tapered construction lets them take both radial and thrust loads, holding drum ends and work conveyor in rigid alignment. As a result, a tight running seal can be maintained, tiny particles of flying abrasive are kept inside the drum.

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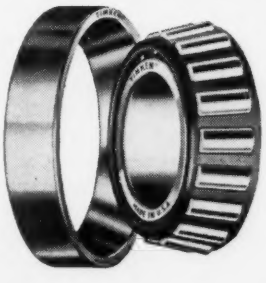

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of the available engineering talent.

D. S. Eppelsheimer, professor of metallurgical engineering, Missouri School of Mines, Rolla, Mo., discussed "The Meaning of Engineering Education and the FEF to the Medium and Small Size Foundry." According to the speaker, small and medium-sized foundries have some real problems in basic areas of production, marketing, management, research and finance. A proper balance between these areas is essential to survival and the only way these foundries can compete is to contract for the know-how of the college-trained engineer.

R. W. Heine, associate professor of mining and metallurgy, University of Wisconsin, Madison, Wis., offered some "Thoughts on New Developments and Engineering Education in the Casting Field." Powerful industrial changes in the last 10 years have changed the complexion of engineering education and as new developments come into being new courses are created to keep pace. Trend is away from the quantitative, descriptive and narrative approach to a more solid, scientific approach.

Reports by various FEF committees opened the second day's program. Speaking for the University Advisory Committee, Prof. C. C. Sigerfoos, Michigan State University, said that many foundries do not understand the most effective methods of recruiting engineering graduates. Early contacts with the schools and establishment of liaison with key professors were suggested. The committee also recommended that the foundation prepare a booklet for small and medium-sized foundries explaining the functions of an engineer.

Charles F. Walton, Gray Iron Founders' Society, Cleveland, reported for the Technical Advisory Committee and pointed out that the engineer is more useful to a foundry in a staff capacity to assist all departments rather than in a line function as a supervisor. The Industry Advisory Committee report by David H. Boyd, Engineering Castings Inc., Marshall, Mich., included suggestions for co-operation between industry and the schools' students and faculty.

"Application of Engineering in Foundries" was the subject of a panel discussion presided over by R. L. Gilmore, Superior Steel & Malleable Castings Co., Benton Harbor, Mich. Types of engineering treated included plant, metallurgical, design and sales.

The plant engineer should be versatile, and industrial engineering training makes the individual best suited for this position, it was stated by C. E. McQuiston, Advance Foundry Co., Dayton, O. J. E. McBroom, Stainless Foundry & Engineering Co., Milwaukee, said that the co-operation of both the industrial engineer and the metallurgical engineer is necessary for successful foundry operation. Preparation of specifications and the actual melting of metal to the correct composition are two different things, he added.

Steps in the design and production of investment castings were described by E. G. Chapman, Misco Precision Casting Co., Whitehall, Mich. These steps include an analysis of the blueprint to see if the part can be cast, how the mold is to be made and what gages and gate grinding fixtures are needed. The investment casting industry, he said, is looking more and more for young men to enter it.

Since the castings salesman contacts engineers in calling on customers, it is desirable that he have engineering training, according to R. A. Lawson, Monarch Aluminum Mfg. Co., Cleveland. He recommended the seeking of sales talent among the plant's engineering personnel and the giving of sales training after the engineering training has been obtained.

Three former holders of FEF scholarships spoke before the conference. C. J. Thomas, Michigan State '55, now is foundry maintenance engineer, International Harvester Co., Memphis, Tenn. He suggested that closer contact between foundrymen and students, such as in attending AFS student chapter meetings and in inviting students in small groups to visit foundries, would help induce graduates to enter the industry.

Ray H. Witt, Case '51, sales manager, Cadillac Malleable Iron Co., Cadillac, Mich., recommended that summer employment of students cover work involving foundry operations and not jobs such as window washing, which provide no training. He also suggested that school faculty members be given more opportunity for acquiring foundry experience during the vacation period.

Jack E. Bolt, Alabama '52, technical service engineer, General Electric Co., Pittsfield, Mass., proposed that the FEF direct a self-development training program in metallurgy for foundry personnel.

James H. Smith presented the film, "To Meet the Challenge," depicting recent developments in foundry methods and equipment by the Central Foundry Division, General Motors Corp. Much of the subject matter of this film is discussed in the article by Mr. Smith starting on page 96.

Dinner meeting of present and past officers and trustees of the foundation

Recommendations For the Future

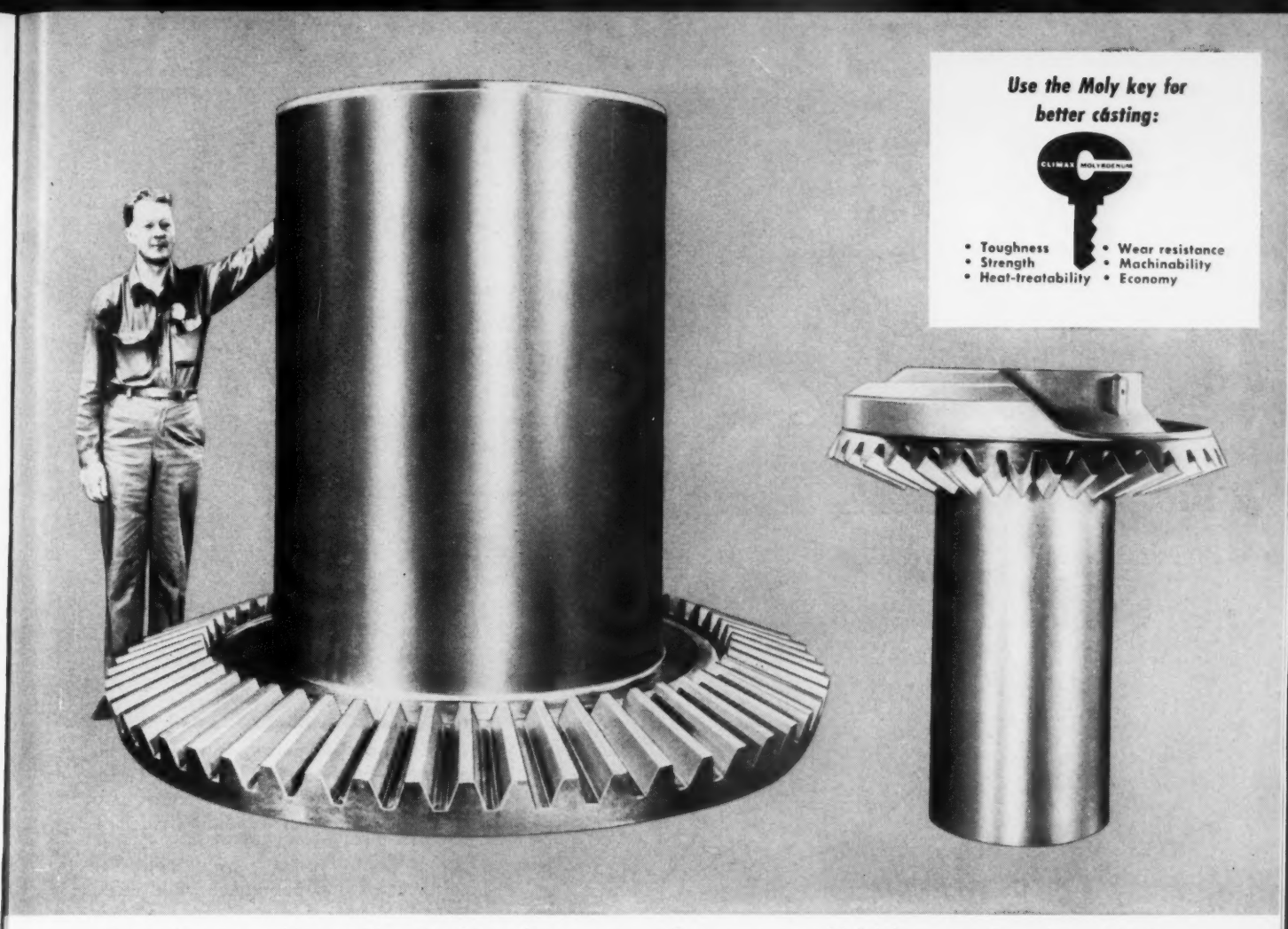
In summing up the high lights of the conference, Prof. E. C. Wright, head, department of metallurgical engineering, University of Alabama, made these recommendations: 1. Improve the effectiveness of students' summer training. 2. Recruit promising boys for college engineering training. 3. Provide the schools more sponsored research projects. 4. Help in providing teachers.

"The Economics of Foundry Engineering" was the luncheon talk subject of C. V. Nass, vice president, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago. Mr. Nass said that competition for graduating engineers is keen. If foundries are to stay in business they must enter this competition to secure young engineering talent and make maximum use of their training.

Young engineers represent the future of the industry and, according to Mr. Nass, they are vitally needed in responsible purchasing, sales, supervision, process development, product development and management positions. The foundry industry—including the small foundry—cannot afford to be without the potential that is within the young college-trained engineer.

A plea for increased financial support for private universities was made in a talk at the conference banquet by Dr. Deane W. Malott, president, Cornell University. Chairman at the banquet was Thomas Kaveny Jr., the immediate past president of FEF, Herman Pneumatic Machine Co., Pittsburgh, and H. E. Helling Jr., Mathews Conveyer Co., Ellwood City, Pa., was toastmaster.

Dr. Malott said that by 1970 the private schools will have been faced with "strangulation" or government support and control, unless there is an upsurge in unrestricted giving by industry and individuals.



Heavy duty ore crushing machinery is subjected to severe operating conditions. To meet these strenuous requirements the gears shown are made from heat treated low-alloy manganese-*Molybdenum* steel castings. At left: a Symons Gyratory Crusher gear; right: a Symons Cone Crusher gear. Built by Nordberg Mfg. Co.

Cast Manganese Moly Steel contributes strength and toughness to Crushers built by Nordberg

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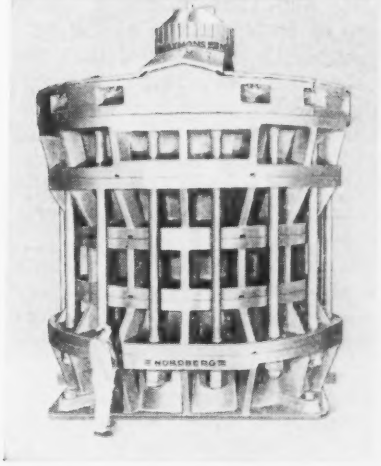
Technical assistance is available to foundries on alloying problems. Please address inquiries on your foundry letterhead to: Climax Molybdenum Company, Department MF20, 500 Fifth Avenue, New York 36, New York.



The Symons Cone Crusher is a product of Nordberg Manufacturing Company.

CLIMAX MOLYBDENUM

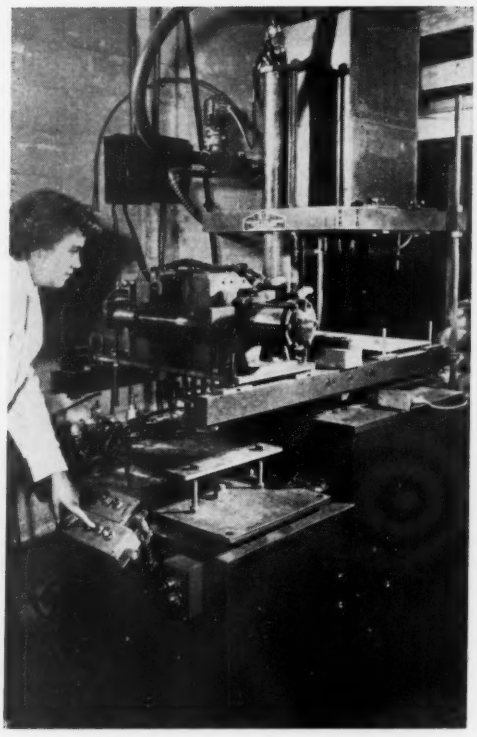


Fig. 2 (above)—Operator pushes button to close heated corebox and start cycle. Resin-coated sand has been loaded into hopper on top of shell molding machine

Fig. 1 (left)—Typical blown shells for molds, cores and permanent mold liners

Factors Involved in Blowing Shell Molds and Cores

By G. A. CONGER
C & S Products Inc.
Detroit

SAND and resin mixtures which are to be blown into heated pattern equipment require that the resin be firmly attached to and minutely dispersed throughout the sand. This is accomplished by a procedure known as coating and can be performed either at room temperature—cold coating—or at elevated temperature—hot coating.

Both methods require that a shear force be applied to the mix to smear the resin over the sand surface. Conventional mullers provide the proper action and generally can be employed without major changes. Minor alterations which are beneficial but not essential involve the use of a dust hood, the addition of a blower and modification of plows and wheels.

Editor's Note: This paper was presented at the Michigan Regional Foundry Conference held at Michigan State University, East Lansing, Mich., Dec. 1-2.

Cold Coating—This method requires the presence of a solvent, usually a commercial grade of alcohol. A typical cold coating procedure using a dry powdered resin is as follows:

1. Sand and resin, containing hexa, is dry mulled for 15 to 20 seconds.
2. Solvent mixture is added and mulled for 3 to 4 minutes.
3. Release agent is added, with the blower on, the mix is mulled to a free-flowing, zero green strength, lump-free state. The time required is 10 to 20 minutes depending on the efficiency of the blower, quantity of solvent used and the necessity of arriving at zero green strength.

Should a degree of green strength be required, for reasons which will be discussed later, a small quantity of kerosene or similar light oil should be added with the solvent. Since alcohol is very volatile and will evaporate during storage of the coated sand, kerosene prolongs the green strength imparted to the mix.

Resin Additions Vary—Normal resin percentages vary from 1¾ to 5 per cent depending on hot strength and collapsibility required. The solvent consists of a mixture of commercial alcohol and water—3 parts to 1 part by weight. Solvent additions are generally made based on the resin level modified and depending on the type and fineness of the sand. Using a clean silica sand of about 100 AFS fineness, solvent is added in a ratio of 4 to 1 by weight, resin to solvent. The water tends to

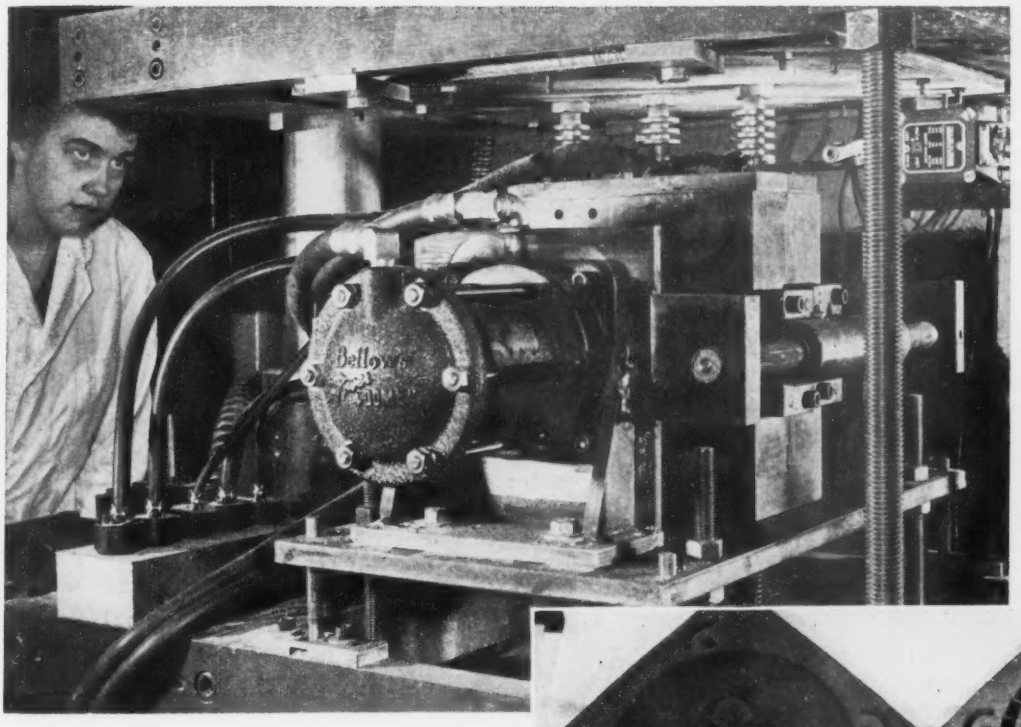


Fig. 3 *(above)*—Machine rotates 180 degrees, aligning pattern under the blow nozzles, and sand mix is blown into the heated pattern, where it starts to cure

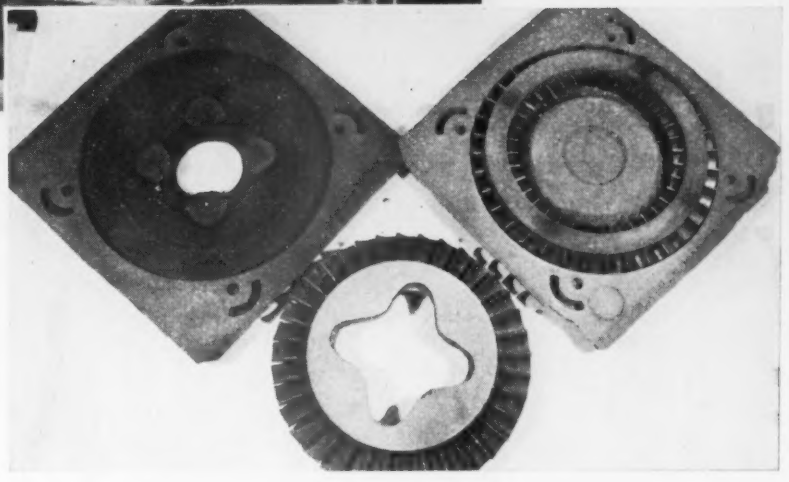


Fig. 4 *(below)* — Diesel engine casting is produced by fusing T-347 vanes into a T-410 hub casting. It is shown with the shell mold and core assembly that holds the vanes in position

slow the alcohol evaporation during coating and materially assists in the dispersion of the hexa during coating. If more solvent is used the efficiency of coating is increased but a longer time will be required to evaporate the solvent to arrive at a free-flowing state.

Excessive solvent also means an increase in coated sand costs. If less solvent is used, coating may not be completed, resulting in resin segregation during blowing. The test of proper solvent addition is the minimum quantity which permits sand to be blown without segregation.

The release agent serves two functions. First, during coating, it permits the lumps to be broken up without reagglomeration, thereby reducing the load on the muller. Second, it functions as a built-in release agent during stripping of the core or mold from the pattern equipment. These agents usually consist of a hard wax or a stearate. Obviously, insufficient release additions will not adequately assist in delumping or in stripping. However, excessive additions are detrimental to the cured strength of the coated sand. Proper additions are based upon the resin level and should be 20 to 1 by weight, resin to release agent.

We have found that precise measurement of the materials added and exact timing are not required and that this formulation can be classified as cook-book mixing, easily accomplished by unskilled foundry labor. Generally, conventional mullers can be operated at about 50 per cent of their rated capacity without modification. The purpose of muller modification is to permit the coating of larger batches in the same time period. Basically, coating is accomplished in 3 to 4 minutes, with delumping completed in approximately 2 to 3 more minutes. It is realized that a muller is a most inefficient aerator. The overall cycle time can therefore be reduced by processing the sand in the muller for approximately 6 to 7 minutes and then completing the solvent extraction in another device such as an aerator, a series of vibrating screens, or by passing air over the sand while being suitably conveyed.

Liquid resins consist of 60 to 80 per cent solids dissolved in an appropriate solvent mixture similar to that described in dry cold coating. The procedure is similar to that previously described with one possible exception. The liquid resin may not contain hexa, in which case it would be added along with the release agent. The other ingredients, permissible variables and results would be similar to cold coating.

Hot Coating—If properly executed, hot coating is a more nearly true coating procedure. As rather precise timing and temperature control is required, a formulation procedure will not be attempted. The user should consult the resin manufacturer. Special equipment is required to complete hot coating. This consists of a means to operate the muller at an elevated temperature and vibrating screens for delumping. The heat source may consist of a water or steam jacket or, more simply, a heat exchanger providing hot air which is blown into the muller. Again, the results and applications of the mix are identical with the cold coating procedure.

Coated sand can be placed in storage for an indefinite period if maintained at a reasonable temperature and in a dry room. Moisture pickup will impair blowability and produce

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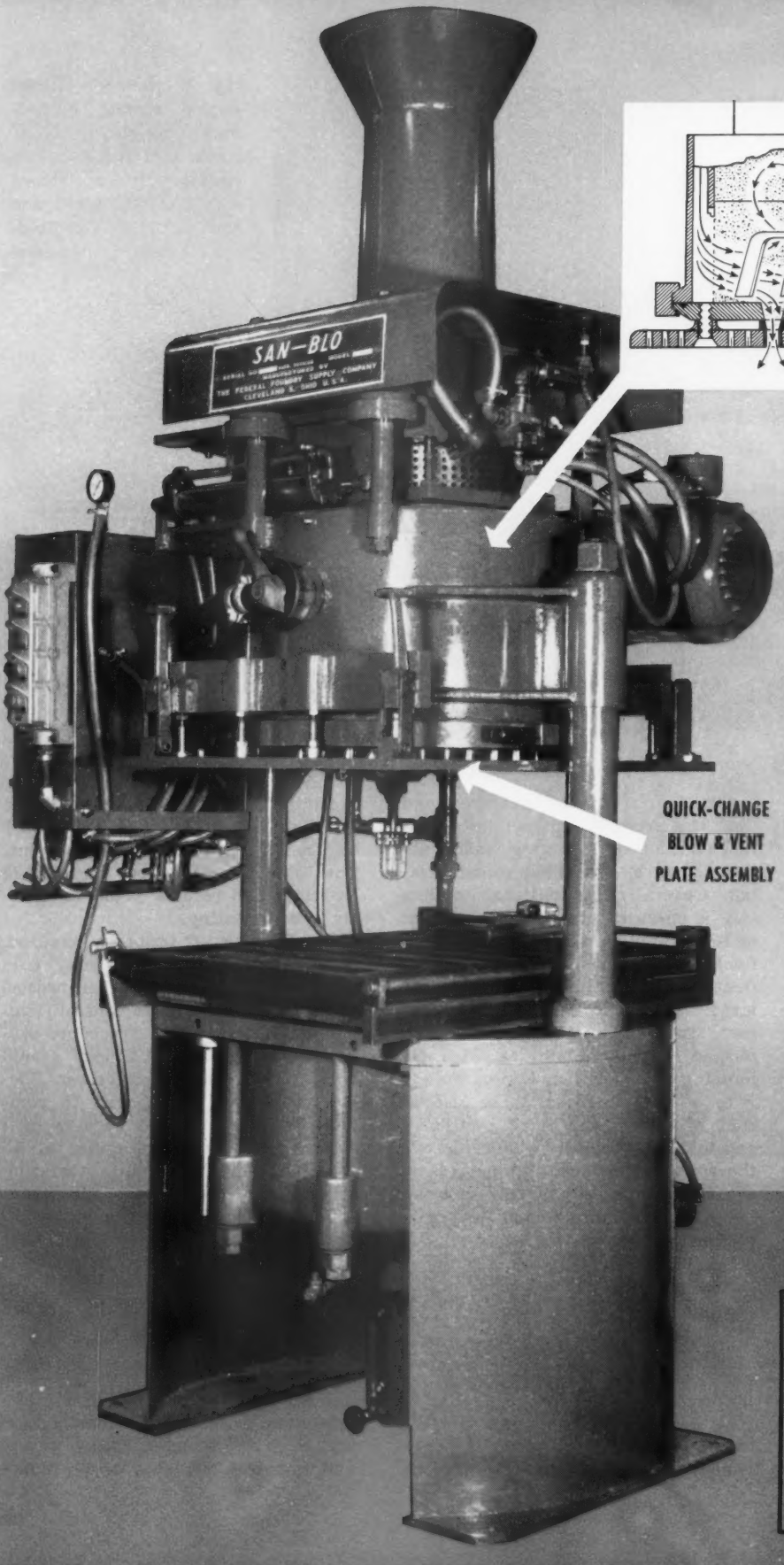

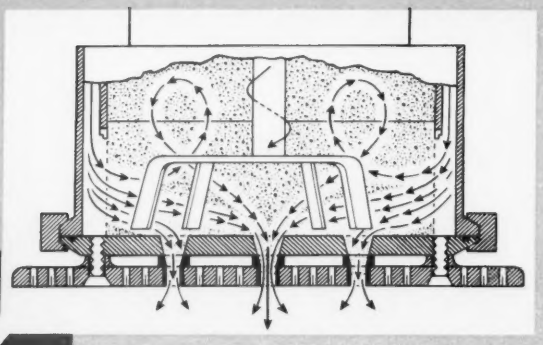

Diagram of SAN-BLO exclusive sand chamber design, showing agitator and air circuit.

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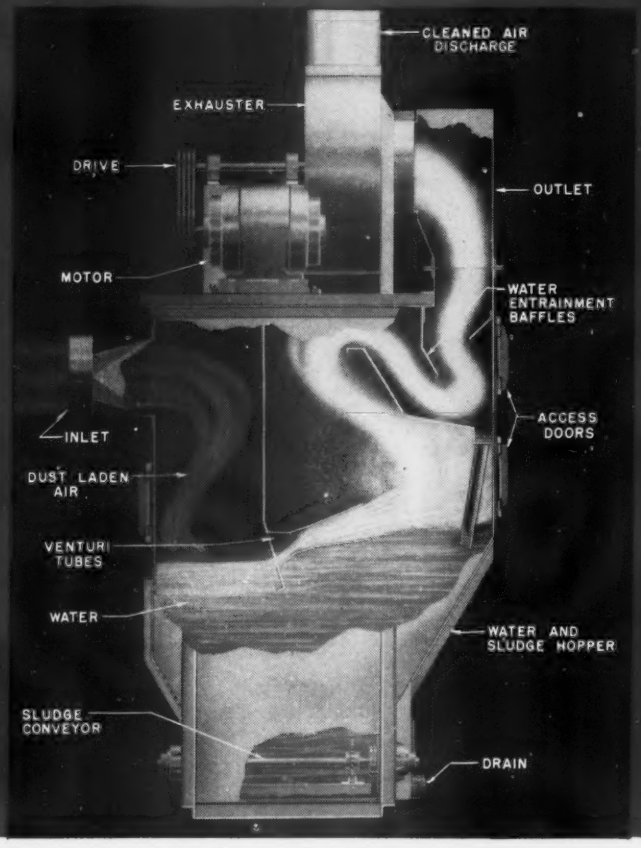

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variable sand physical properties. When coated sand is stored deep, the sand has a tendency to sinter, producing lumps which can be readily broken by screening with no future ill effects. If solvent removal was not carried out to completion, the lumping tendency during storage will be increased, again with no detrimental effects other than the necessity to screen the mix.

The bond produced by resin operates at sand grain contact points. As coating disperses a fixed resin film around the sand particle, the bond strength depends on the film thickness. This film thickness will vary in the same fashion as oil in an oil-sand core mixture. Consequently, finer sands require larger resin additions to maintain cured strength. Likewise, the use of more angular sand or the presence of clay particles and other insoluble materials increase the filmable surface area and reduce the cured strength. With this in mind, additions such as bentonite, iron oxide or silica flour can be used to increase and control the hot strength. Generally the collapse is increased and controlled by the absence of the additives and by reducing the resin level.

Varying the Composition—A variety of coated sands can be formulated by making a stock mixture with 5 per cent resin which is diluted to the proper resin level by dry blending clay-bearing sands, such as Juniata, into the mixture. In this fashion, resin is not dispersed on the clay particle where it would be of little or no use. It is also possible for other additives to be made in a similar fashion. In most shell applications, control of the resin and sand is sufficient to produce a wide range of physical properties, making the mixture adaptable to the production of small aluminum to medium size steel castings.

The sand is the prime factor in the determination of surface finish and hence tolerance of the part. If a shell is blown and cured in a complete closure, opened only when ready to strip, warpage and distortion are minimized. Dimensional accuracies are increased and permit closer reproduction of shells. The use of finer sands, therefore, enables one to reproduce castings to closer dimensional tolerance than in the same part in green sand. Since mold permeability depends on thickness of the sand around the metal cavity, higher mold permeability with finer sand may be achieved in shell molds. In the case of shell cores, the same principles apply if shape and contour of the core is conducive to hollowing by one of the methods to be discussed later.

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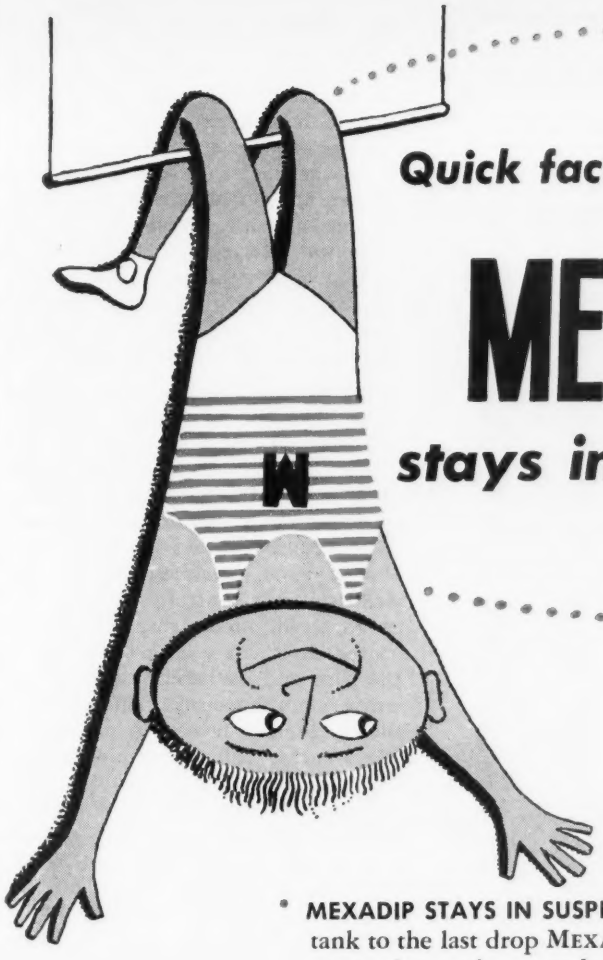
equipment used in blowing both shell cores and shell molds is similar to that used in dumping practices. Complete closures are required, however, so that for all practical purposes one designs equipment as a blower box. Considering heat capacity, heat conductivity, resistance to erosion during blowing, abrasion resistance, machinability, pattern life, warp-free tendencies and cost, the most ideal pattern material is a tight-grained gray iron. Steel, malleable and hard bronzes are good substitutes. Depending on the required dimensional accuracies of the casting, the pattern can be completely machined or more simply cast and bench finished.

Design of a shell blower box is similar to conventional core blower boxes in that venting and blow ports must be provided. Properly coated shell mixtures have high blowability and can be blown around corners and farther than oil-sand mixes. Therefore, lower blow pressures, fewer vents and fewer blow holes are required. By proper design and application of these three factors, very complex shapes can be blown. In many instances few or no inserted vents need be used, employing only the box parting for venting. Proper positioning of a vent will permit the filling to the proper density of remote corners and crevices of the box.

Slotted Vents Aid Operation

We have found that a slotted type vent with a slot opening of 0.010 to 0.015 in. will permit the escape of a small quantity of sand during each blow. This sudden surge of sand through the vent tends to purge the opening of entrapped particles, permitting subsequent complete blows. Improper or too frequent use of release agents tend to block the vents.

Stripping usually demands a push pin to free the shell from the pattern. Shape of the backup plate—the section of the pattern equipment which reproduces the exterior of the mold—will determine the thickness of the shell mold. It may, therefore, be provided with more draft than the pattern plate. Consequently, the backup plate will strip free of the shell without the need for strip pins. Generally, only the pattern plate will require strip pins; sometimes by proper design these can be eliminated. When cores are not symmetrical, they will remain in a preferred section of the box on opening. Again by design, this portion may or may not require pins. If the interior of a hollow core is formed by a section of the corebox, which we will call a mandrel, stripping is accomplished by opening the box, the core being held stationary by the mandrel and finally lifting off it. Complex shapes can be blown and



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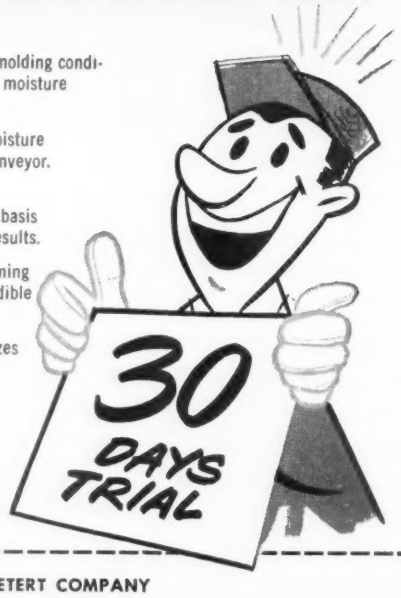

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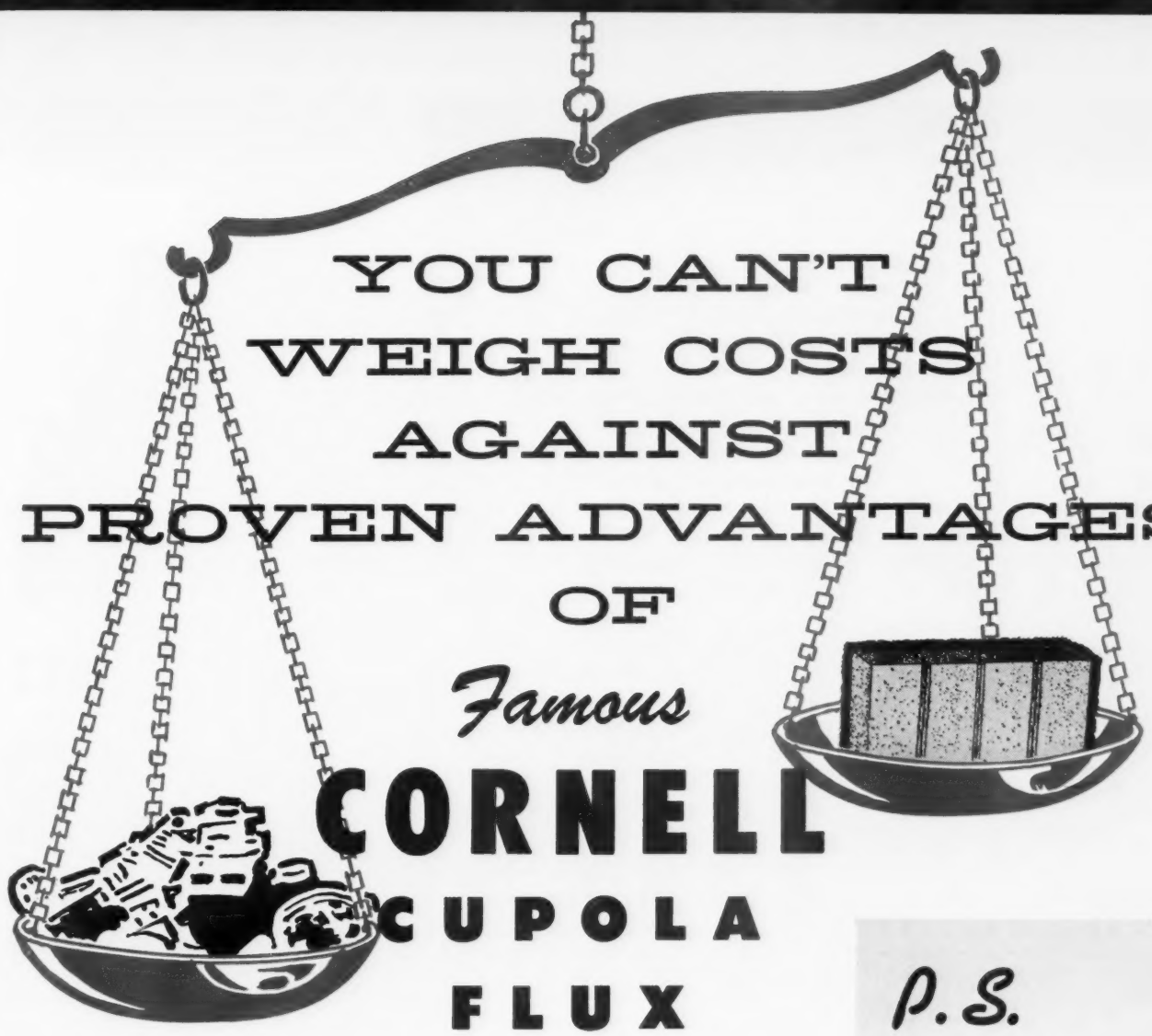
may require multiple part boxes. Proper design will enable one to operate the box automatically so that the operator need only remove the shell. Trouble-free operation is determined by design and surface finish of the pattern boxes. Some shell blowers are available which can handle boxes with either vertical or horizontal partings. Blowing will be accomplished either at the box parting or through the box section, thereby extending the adaptability of blowing shell cores and molds.

Hollow Shell Cores—Hollow shell cores have the advantages of material savings, high permeability and ease of shakeout. If this core hollowness or interior surface can be reproduced by a pattern part, several other advantages are apparent. Like a shell mold, thickness of the core wall is under control—thick or thin as required, minimizing the use of coated sand. Also, both the inside of the core and its exterior surface are cured simultaneously. This shortens the cycle and increases production. Since curing will be completed while the core is in contact with a rigid corebox, no slump or peel back is possible. Use of a mandrel permits the stripping of a core from the box parts without strip pins. The core surface will then be unmarred by pin head impressions. In many instances, venting can be completely contained in the mandrel, resulting in a core surface free of vent imperfections.

Certain core shapes are not readily mandrelled. If these shapes must be hollow, the alternative procedure is to manipulate the box and gravity dump out the unbonded coated sand after a proper dwell period. Again, depending on the shape and design, the unbonded sand can be removed by application of a vacuum to the box. Low pressure is desirable to minimize the cutting action of rapidly moving air. At the moment the unbonded sand is removed, the core is incompletely cured, and care should be exercised to prevent peel-back or fall away of the core. Disadvantages of these procedures are that partially used coated sand must be returned to the system and a much larger volume of sand must be blown into the box. In the latter case a less dense core usually results and the cycle is prolonged.

Pattern equipment maintained at the operation temperature, usually 350 to 500° F, will begin to cure the blown shell cores or shell molds immediately. A distinct advantage is realized if these temperatures are high and the shell thickness is an average ¼-in. Curing from both sides simultaneously, by conducted heat, requires that a machine perform rapidly. Patterns can be heated



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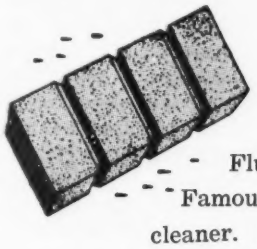

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Make
high-strength
aluminum castings
without heat treatment!

Foundries without heat treating facilities are producing high-strength aluminum castings with Federated's Tenzaloy. Mechanical properties are equivalent or superior to the common heat-treated alloys, and impact strength is greater.

Tenzaloy, a product of Federated research, is a self-aging alloy of the aluminum-zinc-magnesium type. It reaches full strength after a few days aging at room temperature. No special casting precautions or facilities are required.

Tenzaloy castings have excellent machinability. They can be anodized to a superior white color. Tenzaloy is one of the few casting alloys that can be brazed at high temperature. It has corrosion resistance equal to or better than the aluminum-silicon alloys.

If your heat treating facilities are inadequate or too costly, or if you are paying for outside work, or if you are casting large and complex aluminum shapes which cannot be conveniently heat treated, call Federated for more information on modern Tenzaloy. Any of our 13 plants and 23 sales offices across the country is ready to help.

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DIVISION OF AMERICAN SMELTING AND REFINING COMPANY
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IN CANADA: FEDERATED METALS CANADA, LTD., TORONTO AND MONTREAL

Aluminum, Anodes, Babbitts, Brass, Bronze, Die Casting Metals, Lead and Lead Products, Magnesium, Solders, Type Metals, Zinc Dust

Federated first in the non-ferrous field FMD

by one or a combination of several conventional methods—electric resistance heaters, low-frequency induction coils, electric radiant heaters, direct fired gas flames, gas radiant heaters, and gas fired ovens. The most versatile method is electric resistance heaters. These heaters can be placed either on the surface of the pattern equipment or immersed in the pattern equipment. Immersion is most economical due to increased heater efficiency.

A heating element immersed in a good heat conductor will have prolonged life. For simple and complete immersion, a cylindrical or cartridge type element should be selected. These are available in various diameters, lengths and watt densities, permitting the positioning of elements throughout the pattern with a minimum temperature gradient on the pattern face. Pattern projections or cavities can be compensated for in design of heater layout.

Induction heating at 60 cycles, 115 volts has been used successfully. Its use best fits a symmetrical box where the necessary, somewhat bulky external coils do not impair box performance. The other means of supplying heat to the box are external and do not provide for projections or cavities inside the box. These inefficiencies and disadvantages are somewhat counterbalanced, however, by their economy if time is not a controlling economy factor.

Controls Are Conventional—Methods of temperature control are identical with conventional furnace or oven controls. One additional advantage of electric resistance heaters is the ability to sectionalize control of the pattern equipment. Use of immersion thermoswitches, properly positioned, will determine the heat demand in a box section more or less independent of other control points. If the box design is symmetrical and simple, proportional timers, rheostats or variable transformers can be used if a steady operation can be maintained.

When designing the box heating system, consider these factors: 1. Heat distribution and temperature gradients inherent in the system. 2. Temperature gradients produced by heat loss during blowing. 3. Time of recovery to operation temperature. 4. Initial warm-up time. These conditions seem best served by electric resistance cartridge type heating elements.

Coated sand can be blown in most cases at air pressures of 30 to 50 psi. Conventional blowers have most of the necessary components to make shell molds and cores. However, special conditions to be met are best handled by a machine designed to

"People's lives depend on our castings," says Nick Odorisio

"And we depend on Cities Service Core Oil," continues this well-known foundryman at Kimball Brothers Company.

If you operate a foundry, there's a chance you've heard of Nick Odorisio. Now with Kimball Brothers Company of Council Bluffs, Iowa, Nick has devoted the last 45 years to the foundry business, guiding many a mid-west foundry to smoother operation.

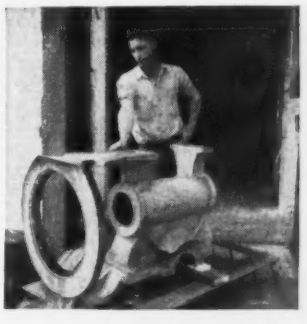
"Here at Kimball Brothers," says Nick, "there's probably less room for error than in almost any other foundry operation . . . for we make freight and passenger elevators ranging up to 30,000 pounds capacity, and people's lives literally hang on the quality of our castings.

"Naturally, that requires perfect cores and perfect core oil . . . and that's why we rely on Cities Service Delco #36. I've been in the foundry business since I was 15 years old and tested a lot of core oil, but Cities Service Delco #36 gives more trouble-free performance than any other oil I've ever seen. The oil is uniform, prevents trouble with gas which could produce flaws, and allows practically no breakage of cores. I'd never hesitate to recommend Delco #36."

For more information about this unique core oil which Mr. Odorisio praises so highly, talk with a Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, 20 North Wacker Drive, Chicago 6, Illinois.

Getting to the Core of the Situation. Kimball Brothers makes cores for elevator castings ranging from a few ounces to 1500 pounds. But there's almost never any breakage or flaws, thanks to Cities Service Delco #36 Core Oil.

Complicated Casting Made Without Complications is displayed by Assistant Foreman Richard Flowers. Like Nick Odorisio, he combines expert knowledge with extreme pride of craftsmanship and Kimball Brothers' castings reflect it.



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NEW MONORAIL CRANE

offers many advantages

For up and over handling this new American MonoRail Crane offers you the following advantages:

- up to 10 ton capacity
- meets low headroom conditions
- extra store room
- carrier service beyond craneway
- fingertip control from floor
- all movement power operated
- low maintenance cost

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"Up-and-Over" is the title of our 16-mm sound film showing how MonoRail solves many tough handling problems at low cost. Please allow us three weeks to schedule a showing for you.

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accommodate such factors as: 1. Hot pattern equipment. 2. Automatic box part manipulations. 3. Controlled high-volume, low-pressure air requirements. 4. Speed in automatic cycling. 5. A free-flowing sand in charging a magazine and in subsequent blowing. 6. Speed control of the various operations to arrive at the proper cycle. 7. Flexibility in handling a variety of box sizes. 8. Flexibility in blowing with boxes parted both horizontally and vertically. 9. Flexibility in the production of either shell cores or shell molds. 10. Heavy-duty yet compact blowing equipment.

Either Direction—It is relatively unimportant whether the sand is

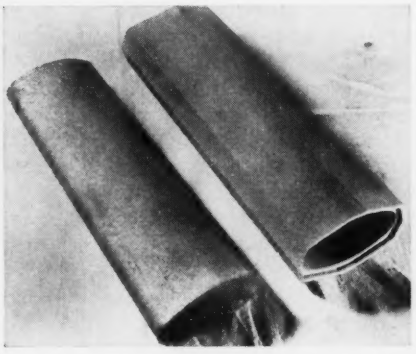

Fig. 5—Anode and a shell mold of type in which it was cast

blown into the box from the top or the bottom. If blown from the top, gravity helps to fill the box; also the magazine and hopper are in a gravity filling position. By designing the magazine movable, a variety of box heights can be readily accommodated. It is feasible to blow the box from the side if conditions warrant. Since a machine is required to perform two distinct functions—filling a box and emptying a box—at least a two-station machine is indicated. With rapidly curing resins available and the maintenance of the box at high temperatures, a two-station machine blowing at one station and stripping at the other station should be employed.

With boxes operating at 450° F, a shell section ¼-in. thick and cured by conducted heat from both surfaces is ready to be stripped in 10 to 15 seconds. In addition, the shell has to be removed, the box blown free of adhering sand at the parting and coated with a release agent from time to time depending on the complexity of the box. While a shell mold or core is being removed and the box conditioned, a second box can be blown and curing started. By a simple adjustment of the box operating temperature and control of the speed of operation of the component machine parts, the second box

"What'sa matter with you guys— can't you make aluminum castings that don't leak?"

Big "leakers" from little pin-holes come.

How to overcome micro and pinhole porosity?

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This is only one of the research and service facilities offered to industry by our company. In addition to controlling our quality with the most modern techniques known, our Metallurgical staff is always at your service. They will be glad to consult with you on any problems related to non-ferrous metals. We can also develop and produce special alloys for any special requirements you may have.

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The George Sall Metals Co., Inc.

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PRODUCERS OF: Aluminum, Brass and Bronze and Zinc Alloy Ingot; Hardeners, Z-shot and bar for Zamak production; Salloy; Special Alloys

will be ready for stripping when the first box is ready for blowing. In this fashion a two-station machine takes full advantage of the requirements of the process, simultaneously requiring the steady attention of an operator.

In porting sand from the magazine to the box, we employ a so-called nozzle consisting simply of a steel tube or steel block with holes drilled through it. These nozzles are positioned on the blow plate to provide blown sand to the proper position when engaged by the box. It is not necessary that the nozzle penetrate the box; rather, a horizontal seating is desirable to minimize the need for accurate nozzle alignment.

Transmission of heat to the nozzles is minimized by an insulating gasket of silicone-bonded glass fiber laminate on the end of the nozzle. The nozzle ID is determined by the sand requirements in blowing. Free-flowing coated sand can be blown at 30 psi through a $\frac{5}{16}$-in. ID nozzle, and will bridge over on the completion of the blow so that upon exhausting the magazine, the nozzle will not leak. If a larger nozzle ID is required, it is necessary to add a small amount of kerosene to the mix to impart green strength. For example, a $\frac{3}{8}$-in. ID nozzle requires about 0.25 per cent kerosene to produce about 0.25 psi green strength in a 3 per cent resin-coated sand of 100 AFS fineness. Further, a $\frac{5}{16}$-in. ID nozzle will adequately move $\frac{3}{4}$-lb of coated sand at 30 to 40 psi and densely fill a perpendicular, circular area within a radius of 4 in. We have blown sand around several right angle turns for a total distance of approximately 11 in. under these conditions. This merely indicates the high blowability of this material and the ability to fill isolated box positions.

Fast Cycle—In comparing blowing of shell molds versus the more conventional dumping procedure, it is apparent that blowing into a complete closure will produce a faster cycle. In addition, one has the opportunity to contour the external shape of the mold. This shape can be designed to accommodate mold clamping fixtures or conventional foundry weights resting upon predetermined, accurately reproduced cope pressure points. The drag pressure points can be positioned so that the mold can be placed on a conventional flat conveyor pallet bottom board or on the foundry floor. In this fashion, the need for pasting, bolts, fasteners, clamps and shot is eliminated.

A properly designed backup plate also should provide for proper shell mold thickness consistent with the casting thickness at any point in the mold. Minimium coated sand will then be used and always in the same quantity, making costing more accurate. The high projections on the pattern can be surrounded by a predetermined thickness of sand to be cured from both surfaces.

Similar conditions exist in the blowing of cheek sections for stack molding. Since all surfaces of the mold can be determined, a check section which is a complete mold can be produced. These cheeks can be stacked to convenient heights for pouring. Again, pasting and accessory bonding are not necessary if positive clamping or proper weights are employed. In a rigid shell mold, small cavities can be placed very close together, and with minimum thickness of a cheek an extremely dense mold package is produced.

Permanent Mold Liners—Again due to the ability to control all surfaces of the shell, another unique application is possible—permanent mold liners. In instances of high permanent mold cost and short life, an expendable shell mold liner can be inserted to protect the metal mold face.

The permanent mold then becomes a complete shell mold backing device of practically unlimited life. The shell molds can be made very thin, say $\frac{1}{8}$-in., so that some of the desirable permanent mold casting physical properties can still be achieved. Shell liners are being used in the production of both static and centrifugal castings. Several notable examples are automotive brake drums, cast iron pipe, ingots and anodes.

Blowing of shell cores is a natural application. Due to the numerous advantages which result in an economic saving, a sharp pencil is required to determine the dividing line between shell core and oil bonded core applications. If cores are to be produced in large quantities, the possibility of shell blowing should be thoroughly investigated.

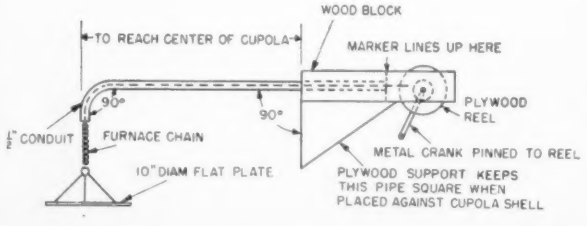
Cores of considerable bulk and heavy section can be reduced in weight in some cases as much as 75 per cent. On the basis of material savings alone, shell cores could then represent a savings. A hollow shell core even if produced in a fine sand, can have better overall permeability than a conventional core plus an overall lower quantity of gas-producing ingredients. Many casting users can take advantage of a smoother cored surface and the accompanying greater accuracies.

HOW TO DO IT

Gadget for Measuring Cupola Bed Height Protects Operator from Heat

CHECKING proper cupola bed height is an important job of the cupola operator. It is a hot one, too, with some danger of his getting burned. The device described here measures bed height accurately and keeps the operator away from the heat of the cupola.

Nicknamed the "fish pole" the gadget consists of a flat metal plate which is lowered down the center of the cupola at the end of a chain. The chain passes through $\frac{1}{2}$-in. metal conduit mounted in a wooden framework which also contains a reel for raising and lowering the chain. A piece of copper wire wrapped around the chain serves as a marker to indicate the desired bed height when the plate is lowered into the cupola



Do you have any tricks of the trade tucked away with your foundry experience? Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $15 for each idea submitted and published. Send a photo or drawing with you idea

Interested in REAL PRODUCTION in Shell Molding or Shell Sand Preparation?

THE COLD PROCESS
SHELL SPEEDMULLOR

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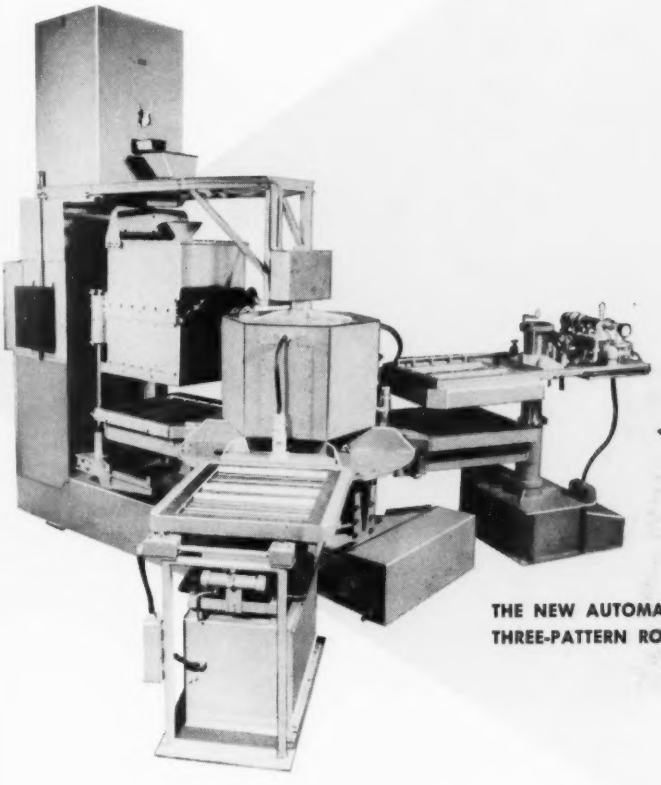

THE NEW AUTOMATIC
THREE-PATTERN ROTARY FORMATIC UNIT

Regardless of your requirements for shell molding or shell sand preparation, there's a machine in B & P's complete line engineered to your needs. There are one, two, three and four-pattern rotary Formatic units. Now, you can start operation with the simplest *real production* installation and provide progressive increases in production by adding more pattern stations.

There are the hot-process and cold-process Shell Sand Speedmullors. The amazing new cold process unit produces free-flowing, non-clumping resin-coated sand in one fifth the time required by any other equipment. The Shell Sand Mulbaro, offering many of the advantages of the Shell Sand Speedmullors, is available for those plants where sand requirements are smaller.

THE SHELL MULBARO

Use the reader service card inserted in this publication to obtain your copy of B & P's new Shell equipment catalog.

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FOR BETTER METHODS

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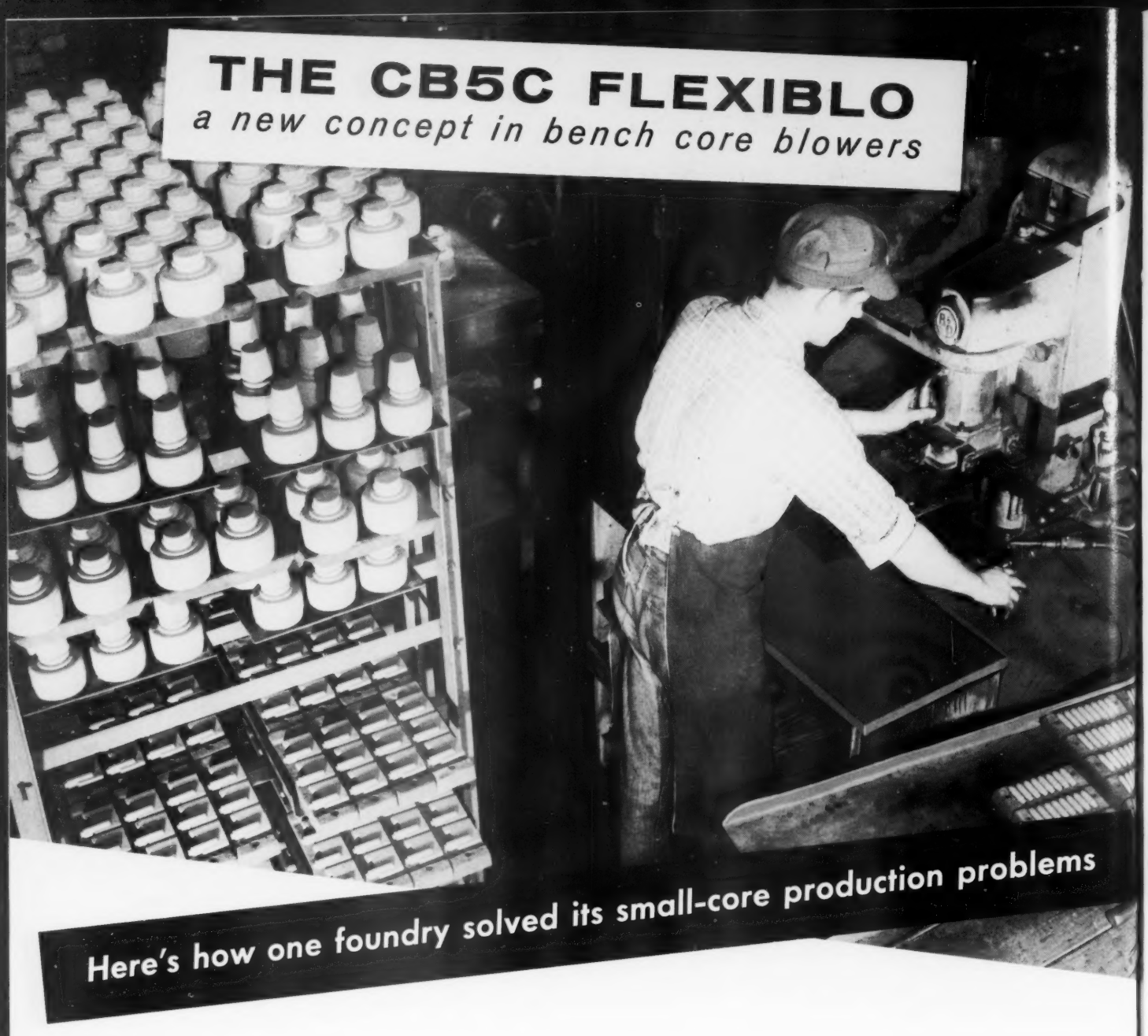
THE CB5C FLEXIBLO

a new concept in bench core blowers



Here's how one foundry solved its small-core production problems

Few small jobbing foundries can afford to pass up the advantages of core blowing. Especially, now, that there is a small blower designed with full flexibility for all their needs. It's the new CB5C . . . the core blower designed with the small foundry in mind.

The CB5C quick change blow plate allows plate changes in seconds. . . means more core boxes can be handled. The new *push button* control automatically sequences the entire operation — there is no chance for error — just push a button and the job is done. An easily removable table clamp provides even more flexibility — all types of boxes may be handled on the new CB5C. Its capacity is 4½ pounds per blow.

At the Letz Manufacturing Company of Crown Point, Indiana, they've found the new CB5CD (the Letz machine is the full two-inch draw model) invaluable in handling a very wide range of small cores. Their new CB5CD, with an older B & P Champion CB 10, handles a very large portion of their small-core production. They have eliminated many of their core room production problems and their experience has shown that their blown cores are truer and more uniform. You can double or triple your production too — investigate now! Use the reader service card in this publication to request more information on the new CB5C or CB5CD (two inch draw model).

LOOK TO
BEARDSLEY & PIPER
FOR BETTER METHODS

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THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINERY

Industry BRIEFS

INDUSTRIAL Heating Equipment Association, Washington, reports that orders for industrial furnaces for January totaled $10,244,066, a 106 per cent increase over $4,973,088, for January, 1955. January orders for induction and dielectric heating equipment of $1,221,339 compare with $1,031,104 a year ago, up 19 per cent.

Woodward Iron Co., Birmingham, plans to spend $8,700,000 on expansion of its facilities in 1956. The expansion will include construction of a sintering plant; rehabilitation and development of Longview Lime Corp. properties at Saginaw, Ala.; extension of development of the Mulga coal mine; and replacement of power generating equipment. The company also is considering development of its iron ore reserves in the Wildwood, Ala., area.

Shallway Corp., Connellsville, Pa., has established a shell molding research and development center in that city. It will be "a clearinghouse for the exchange of technical information relating to shell molding pattern and corebox design." William J. White, general manager of Shallway, will supervise operation of the center.

Stillman White Foundry Co., Providence, R. I., is celebrating its 100th anniversary this year. The oldest existing nonferrous foundry in Rhode Island, if not in New England, Stillman White produces bronze and aluminum castings for widely diversified industries.

W. H. Winterborne & Sons Engineering Works, 321 Austin, San Antonio, Tex., suffered fire loss estimated at $50,000 on Feb. 18. Owners of the foundry stated that the plant would be rebuilt and back in operation within 60 days.

Foundry Equipment Ltd., Leighton Buzzard, Bedfordshire, England, has taken over the manufacture, sale and servicing of the Magnetic molding machines previously manufactured by British Insulated Callender's Cables Ltd., London.

General Refractories Co., Philadelphia, is planning to build a plant at Smithville, Ont., by its subsidiary, General Refractories Co. of Canada. The plant will be located on the Niagara Peninsula, 20 miles from Hamilton. Construction will begin this spring.

William F. Jobbins Inc., Aurora, Ill., aluminum smelter, has been sold by Acme Aluminum Alloys Inc., Dayton, O., to a group headed by the present management. It consists of C. V. Cooper, president; R. K. Arundale, vice president; and J. J. Stumm, secretary-treasurer. These officers will continue to operate in the same capacities. Jobbins Inc. has smelted aluminum for 50 years and produces both primary and secondary metal.

Consolidated Brass Co. has moved from Detroit to Charlotte, N. C., where it occupies a modern, one-story plant including new equipment at 2019 North Tryon St. The company will continue its line of such products as water gages, pop safety valves, brass plumbing goods, ground key cocks and other items. Consolidated had been located in Detroit for 55 years.

Foote Mineral Co., Philadelphia, plans to purchase Electro Manganese Corp., Knoxville, Tenn., and operate it as a division. Electro reportedly is the largest producer of pure manganese in the world.

Industrial Truck Division, Clark Equipment Co., Battle Creek, Mich., has appointed two firms to sell and service its line of fork trucks, straddle carriers and powered hand trucks. Lifton Inc., 10521 Pearmain St., Oakland, Calif., will serve seven counties and part of an eighth in northern California. West Industrial Equipment Inc., South Military Highway, Norfolk, Va., will serve ten counties each in Virginia and North Carolina.

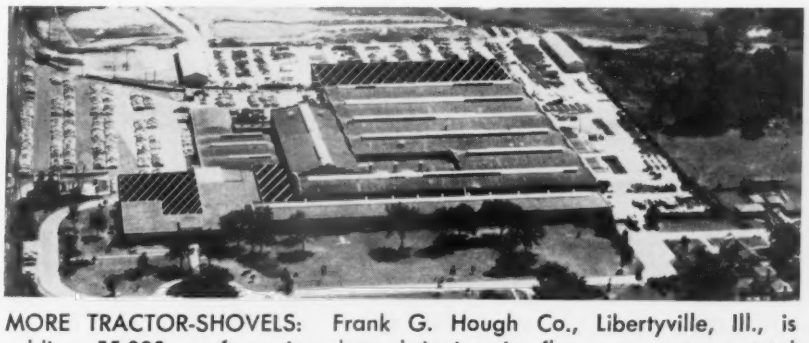
Acheson Industries Inc., New York, will construct the first colloidal graphite manufacturing plant in the Netherlands, near the harbor of Eexta, Borough of Scheemda, at an estimated cost of $135,000. The Scheemda unit will have sufficient capacity to satisfy all Continental requirements.

J. B. Ehrsam & Sons Mfg. Co., Enterprise, Kans., has purchased Morse & Koob Inc., a Wichita, Kans., foundry, and has begun operations as Ehrsam Wichita Foundry Inc. No changes in personnel are anticipated. Ehrsam Mfg. has been in the foundry field for 82 years.

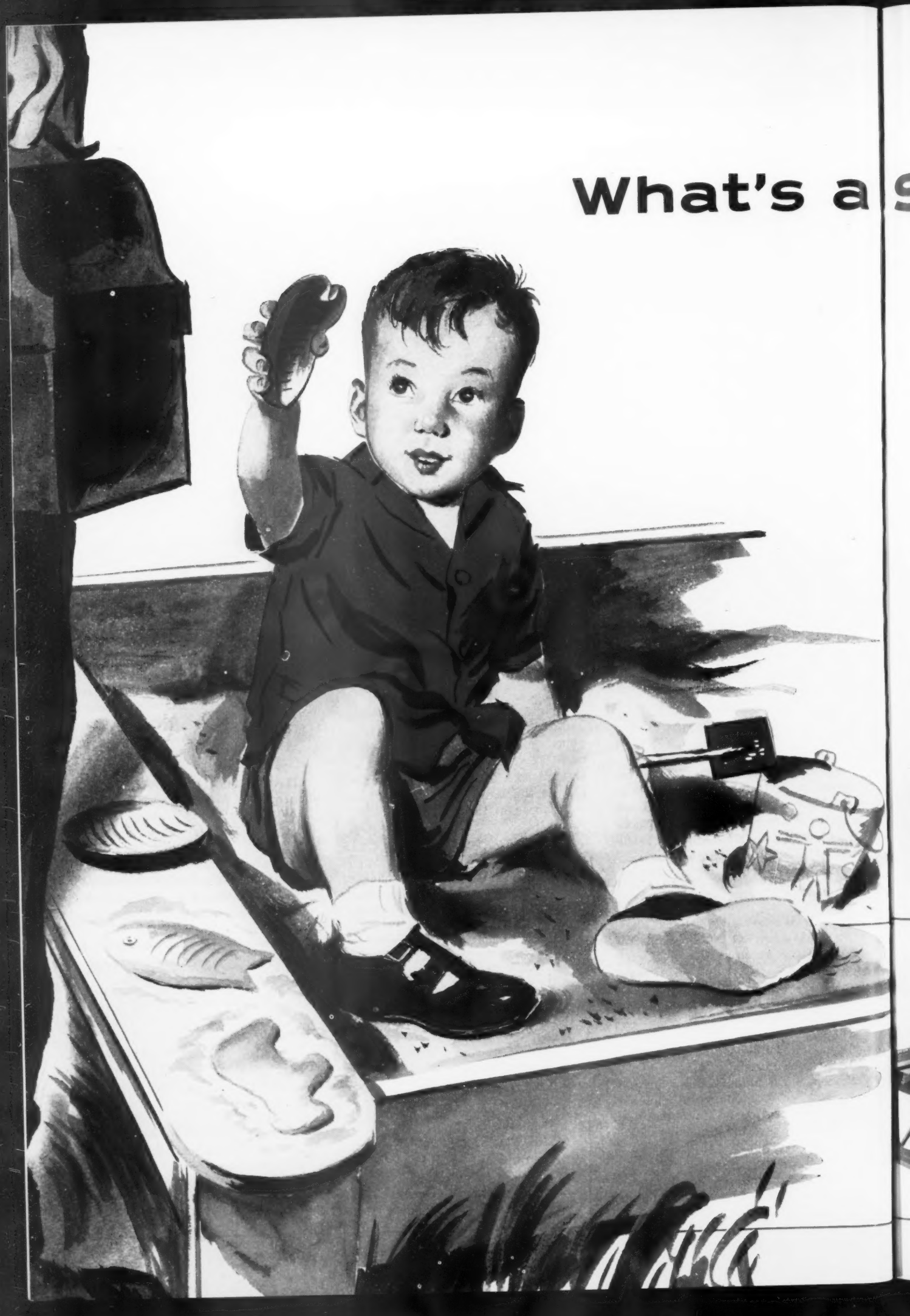
Simplicity Engineering Co., Durand, Mich., has completed plans for a plant expansion of 50,000 sq ft, 50 per cent of its present floor space. Construction will begin as soon as weather permits, and the building is expected to be finished some time this summer.

Dow Chemical Co., Midland, Mich., has opened an office at 400 Market St., Camden, N. J., which replaces its former Philadelphia office.

Abrasive & Metal Products Co., Detroit, has acquired its fourth subsidiary, Sta-Warm Electric Co., Ravenna, O., manufacturer of electrical-



MORE TRACTOR-SHOVELS: Frank G. Hough Co., Libertyville, Ill., is adding 55,000 sq ft to its plant, bringing its floor space to a total of 368,000 sq ft. The addition will give the plant 32 times as much area as it originally occupied when it was moved to Libertyville from Chicago in 1942. Completion of the new facilities is expected this year


What's a

a SPOMATIC, daddy?

"A SPOMATIC, son, is a big machine. It makes sand molds... just like you're doing. But it makes hundreds in an hour. And it does it all day long... all automatically. Another fellow and I run one at the foundry. It's easy!

"Actually, it is more than just a machine. It's a whole new system in itself. This one machine... this SPOMATIC... does more work in one day than a dozen ordinary machines. That's why my boss says it is the biggest money-maker in the business.

"Try to beat the SPOMATIC's performance if you want to, son, but remember... *there isn't a foundry molding machine in the world that can!*"

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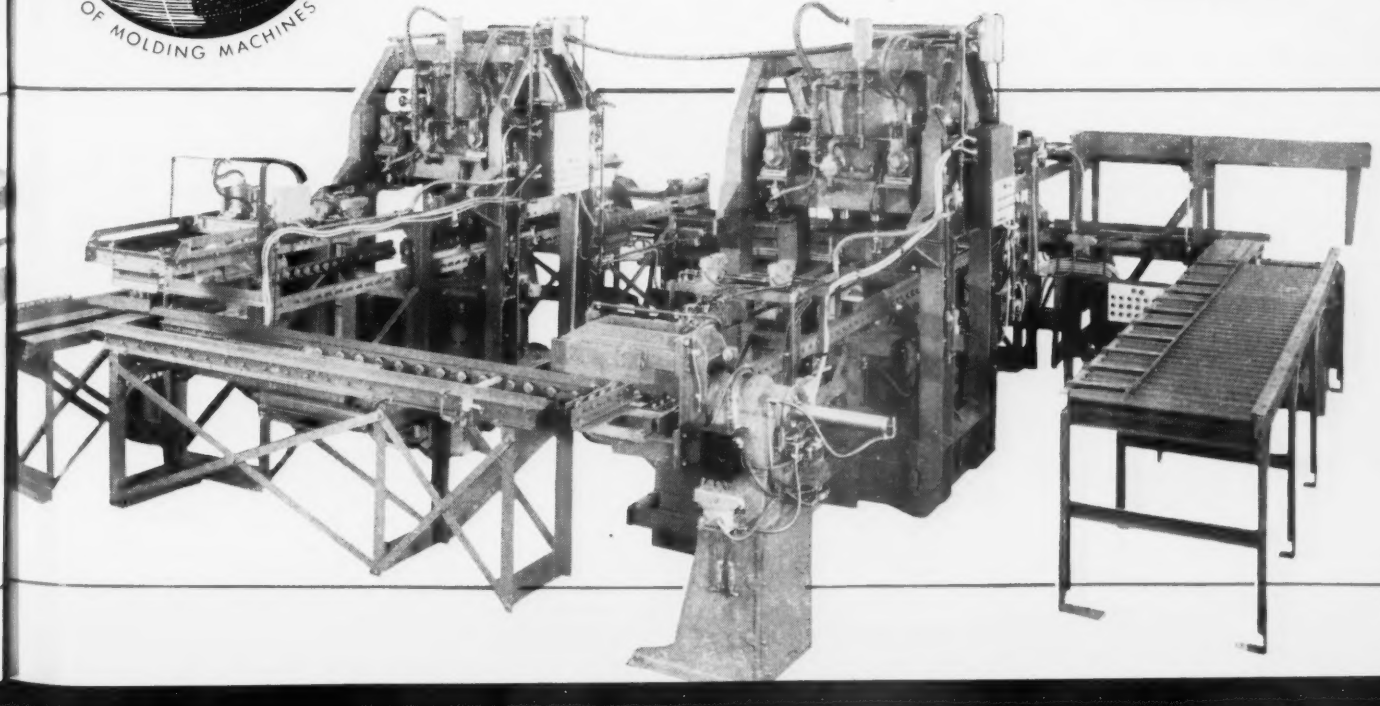

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Melting non-ferrous metals? You'll save with Acme melting pots and ingot molds. They require less frequent replacement because they're cast from a special iron formula that combines strength with the ability to withstand high temperatures. They improve production, too, because they're designed for even distribution of heat without hot spots. More than 30 years' experience in this field is your assurance of high quality in Acme melting pots and ingot molds . . . designed *by* foundrymen, *for* foundrymen.

Quick delivery anywhere in the United States. Write for size list showing 40 standard sizes.

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ly heated equipment. Other subsidiaries include Motors Metal Division and Peninsular Grinding Wheel Division, both of Detroit, and Sterling Grinding Wheel Co., Tiffin, O.

Massey-Harris-Ferguson Inc., Racine, Wis., has established an Industrial Division to market a full line of light and medium-duty industrial wheel tractors and attachments. B. R. Bermann, formerly general service manager of Ferguson Division, has been named sales manager of the new division.

United States Steel Corp. has closed the Joliet, Ill., foundry of its subsidiary, American Steel & Wire Co. The foundry served the needs of other U. S. Steel plants, but those needs now are filled by foundries in those plants.

Cerro de Pasco Corp., New York, has appointed Buffalo Die Supply Corp., 440 Terrace Blvd., Depew, N. Y., to distribute its alloys in 38 counties of western, central and northeastern New York and in 13 counties of Pennsylvania.

Luria Brothers & Co., Philadelphia, dealers in scrap, have opened an office in the Royal Bank Bldg., 26 James St. South, Hamilton, Ont., Canada. I. L. Vosko, formerly in the Montreal office, has been appointed district manager.

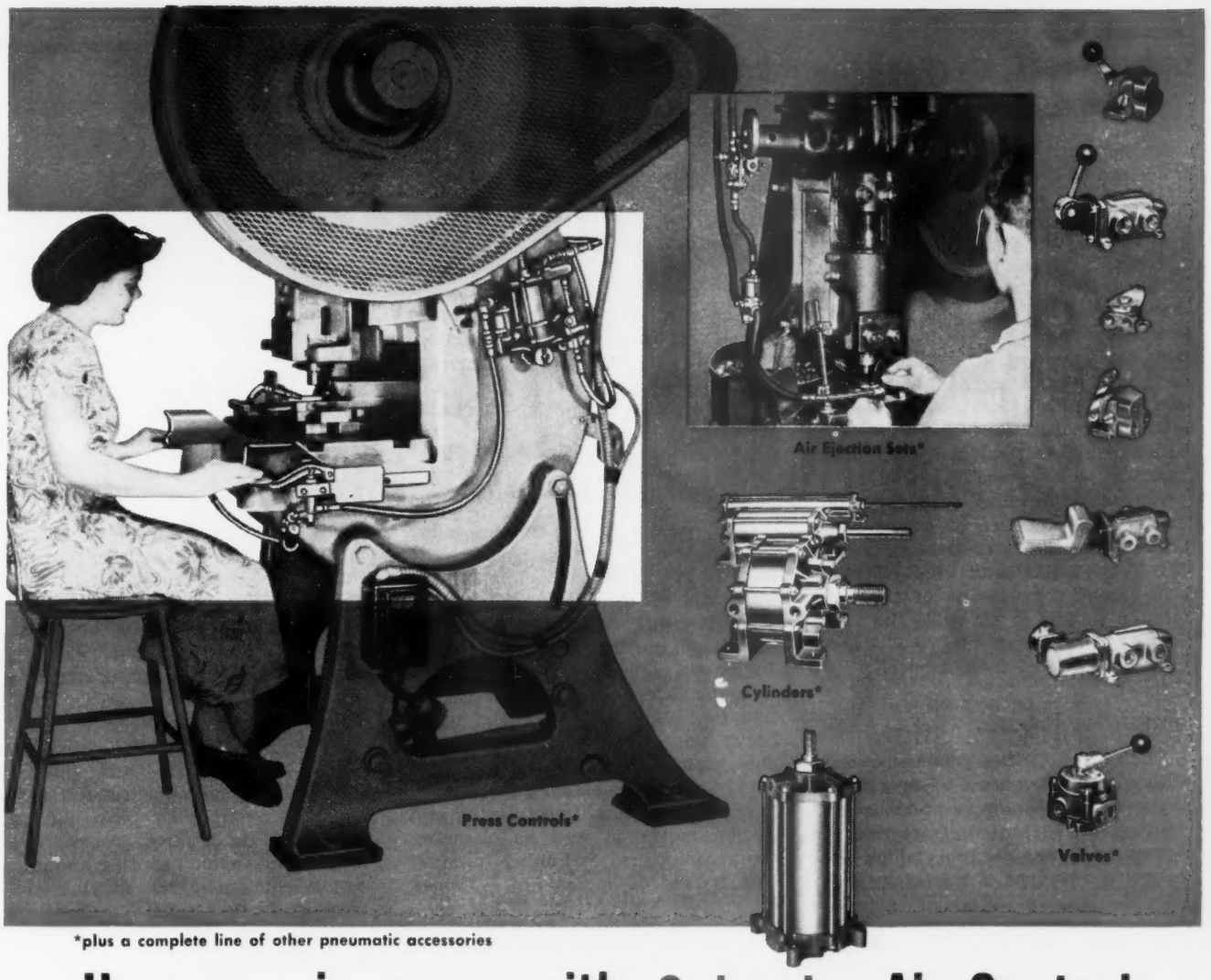
Baker-Raulang Co., Cleveland, has appointed W. W. Munroe Co., 728 Evans Ave., St. Louis, to distribute its industrial material handling trucks in St. Louis, southern Illinois and eastern Missouri.

Holcroft & Co., Detroit, producer of heat treating furnaces, will be represented by International Furnace Equipment Co. in Great Britain, Australasia and all British colonies and dominions except Canada.

Colonial Metals Co., Columbia, Pa., marked its 10th anniversary on Feb. 1 by dedicating a new control laboratory staffed by four people. Colonial smelts about 5 million lb of brass and aluminum per month.

George Sall Metals Co., Philadelphia, has appointed William G. Koles, 18527 West Eight Mile Rd., Detroit, to be its sales engineering representative in Michigan.

Deming H. Lucas, foundry supplier, has moved to 6809 North Greenview Ave., Chicago 26.



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Take a look around your plant—keeping in mind where air power could do the job better. Then let us help you develop your ideas into neat, efficient air line hookups that will pay for themselves over and over again the first year. For specific information, write—or, if you prefer, fill out the convenient coupon below.

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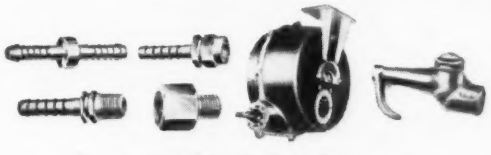

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Foundry Developments

By EDWIN BREMER
Metallurgical Editor

IMPORTANCE of keeping corebox vents as clean as possible is clearly illustrated in a test recently conducted by San-Blo Division of Federal Foundry Supply Co. In this test, new, clean 40-mesh screen vents were compared with used vents of the same type taken from coreboxes. The latter vents had been blown out and brushed and appeared clean. Both types of vents were attached to a permeability machine used for sand testing, and 2000 cc of air at constant pressure passed through them. The new clean vents required only 0.23 second for passage of the designated volume of air while the used vents required from 4.98 to 17.7 seconds—or 20 to 50 times longer.

Simplifies Process

FIRING of vitrified grinding wheels without use of a sand layer on the supporting batt now is possible, according to Electro Refractories & Abrasives Corp., Buffalo, which developed a new type of refractory supporting batt or slab. Termed a "sandwich" slab, it is composed of two outer layers of either mullite or zircon with a silicon carbide layer in the center. This type of construction, according to the maker, prevents warping even after many firings, and the inert facing of the slab eliminates sticking.

Relies on Rigidity

ONE producer of aluminum-alloy permanent-mold castings believes that rigidity in molds and equipment are important factors in making large castings which must meet close tolerances on dimensions and distortion. Judgment is backed up by installation of machines similar in construction to die casting equipment, using heavy tie bars with fixed and movable platens. Platens are equipped with t-slots for affixing the heavy mold halves in position. Opening and closing molds as well as clamping are accomplished hydraulically. Movable halves of molds are equipped with ejection pins so that castings may be removed without distortion.

Dust Control

STUDIES of a number of ventilated shakeouts by the British Cast Iron Research Association have developed data which can be applied to the design of side draft equipment. This design is said to provide effective control of dust and fume-bearing air currents with use of a minimum volume of exhaust air. Information is presented in an article "Dust Control at Foundry Knock-outs" by W. D. Bamford in the October, 1955 issue of *BCRI Journal of Research and Development* (Birmingham, England).

Titanium Casting

RECENT report indicates that if current investigations prove fruitful, Symington-Gould Corp., Depew, N. Y., may install vacuum melting and processing equipment for making titanium and other superalloy castings.

Cupola Coke

DISCUSSING cupola operation, one expert points out that when the proper amount of coke is charged consistently, the iron composition and melting rate will be reasonably constant. Drift in one direction or the other indicates too much or not sufficient coke, while up and down variations reflect irregularities in coke weights, charge make-up or charging procedure. Frequent use of booster coke charges shows improper amount of coke on regular charges or irregularities in cupola practice.

Resists Heat

SERVICEABILITY of nodular iron in elevated temperature applications is indicated in a report issued recently by Simonds Saw & Steel Co., Fitchburg, Mass. Applications of the material included furnace frames and doors on heat treating equipment, and pots for holding molten lead for heat treating operations. Nodular iron doors for furnaces operating at 1800 to 2100° F lasted four times longer than gray iron doors. Lead pots operating at 1450° F lasted only 3 to 4 weeks when made of gray iron, but nodular iron lasted 13 to 17 weeks.

ULTRASONIC INSPECTION: Despite its size, this alloy steel mandrel manufactured by the Rolls Division, Blaw-Knox Co., Pittsburgh, is being inspected internally by electronics for hidden flaws before final machining and grinding. Inspection is being made with the unit on the cart at the right. The small head being held to the end of the mandrel sends an ultrasonic wave through the metal. If this wave finds an internal flaw, a wave reflection results which shows on a reading scale on the face of the machine

BASIC NEWS
FOR CUPOLA OPERATORS

Basic Refractories offers field service to foundries

Cupola operators interested in adopting a basic practice can get refractory information and assistance from Basic Refractories' engineers. These men know refractory application and are familiar with cupola practice.

CONVERTING FROM ACID TO BASIC CUPOLA OPERATION INVOLVES CHANGING ONLY LINING IN MELT ZONE AND WELL

Replacing the acid lining in these two areas involves a comparatively simple changeover. And maintenance is easy after the basic lining has been installed.

Usual procedure is to place an insulating material or a course of fireclay brick next to the cupola shell. Then one or two courses of basic brick are installed to complete the permanent lining.

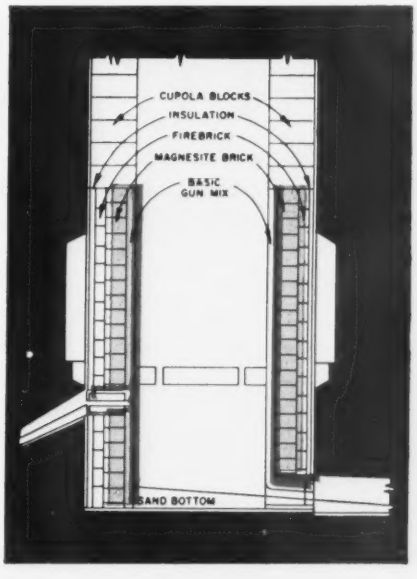
The height of the melt zone area determines the height to which the basic brick should extend above the tuyere level. This varies in each cupola. Usually a basic lining 60 inches above the tuyere level is adequate. Insulation next to the shell is desirable to avert excessive heat loss, since the thermal conductivity of magnesite brick is much greater than that of fireclay brick.

When brickwork has been completed, a fire is built in the cupola to completely remove moisture. After the bottom is dropped, brickwork should be covered with 2 or 3 inches of GUNDOL. This forms the working surface of the basic lining. It should be emplaced by a refractory gun specifically designed for this purpose.

Sand can be used to form the bottom of a basic-lined cupola and is usually better than basic materials, since it will not "hang up" when the bottom is dropped.

The slag hole of a rear slagging basic cupola is subject to severe chemical and mechanical erosion. GUNDOL can be used to install the slag hole quickly and easily. It is installed by either shooting or ramming the refractory around a pipe or rod the diameter of the desired hole.

With proper operation of the cupola, the tap hole of a rear-slagging basic lined cupola is almost trouble-free. Forming the tap hole with GUNDOL is convenient and saves time, since both it and the slag hole can be installed while the lining is being repaired with the gun.



Maintaining Basic lining is easy

Replacing brick work is seldom necessary if the cupola is properly maintained. And with the BRI Gun and GUNDOL, maintenance is easy and less time consuming.

GUNDOL, a basic gun refractory made by Basic Refractories, Inc., is a carefully controlled mixture of specially prepared dead burned dolomite and hydration resistant dead burned magnesite. To this, small amounts of chemicals are added as bonding agents.

8 advantages of Basic cupola operation

Basic lining and repair materials initially cost more than acid. But these costs are offset by the following advantages:

1. Lower sulphur content in the iron produced
2. Greater carbon pickup
3. Steel scrap can be substituted for high-cost low-phosphorous pig iron without lowering the total carbon content of the iron produced
4. Lower cost metal charges can be used
5. Less scrap castings
6. Better pouring characteristics of metal
7. Absence of bridging and clean drop
8. Higher metal tap temperatures

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Dear Reader:

As you read this issue .....

Our printing presses will have started to roll with first forms of the special May Pre-Convention issue.

As advertised, the spectacular May issue of FOUNDRY will bring you (in addition to regular features) these two outstanding reports to foundrymen:

* TOOLS FOR TOMORROW'S FOUNDRY PROGRESS: An exclusive editorial round-up of news and information on significant developments and trends effecting future foundry progress. Foundry technology --- foundry practice --- management leadership --- equipment and supplies --- types of machines, supplies, services foundrymen say they want --- trends in these areas will be fully discussed.

* THE AFS CONVENTION STORY: Look to your May Pre-Convention issue to give you detailed program and exhibit information on the Atlantic City meetings and show.

Happy thought ---- you deserve to have your own personal copies of FOUNDRY (if you are reading this issue as a "passalong reader"). Elsewhere in this issue you'll find a convenient-to-use subscription card. It calls for air mail delivery to hurry your instructions to us to start your personal subscription with the BIG May Pre-Convention issue.

For more information, use Reader Service Card, page 187

No problem at all to obtain literature and more information on new equipment, supplies, services described and advertised in any issue of FOUNDRY.

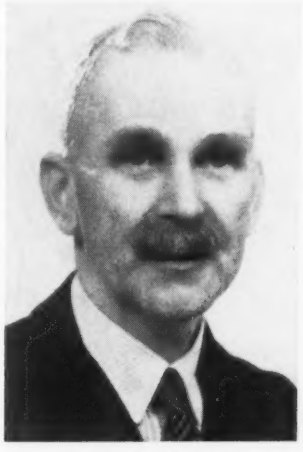
You are invited to use our handy, new Reader Service Cards; a feature of this issue on the page indicated.

FOUNDRY

Obituary

KEITH WILLIAMS, 66, vice president and general manager, Pratt & Letchworth Division, Buffalo, and vice president of the parent company, Dayton Malleable Iron Co., Dayton, O., died Feb. 15. Active in technical organizations, Mr. Williams belonged to the Western New York Chapter of the American Foundrymen's Society and was a former treasurer and director of Steel Founders' Society of America, serving on many special committees of the latter organization.

John Cameron, 86, well known Scottish iron foundryman, died recently. Mr. Cameron, until his retirement in 1945, was managing director of Cameron & Roberton Ltd., located near Glasgow, which his father helped found in 1869, and which is now associated with Federated Foundries Ltd. In 1917 he joined the Institute of British Foundrymen, and became its president in 1925. He was awarded the Oliver Stubbs Medal of the institute in 1931 for his outstanding services. In 1926 he visited the United States as head of a British foundry delegation and later participated in foundry congresses which met in many countries in Europe.



JOHN CAMERON

Andrew D. Johnson, 69, former president, Muskegon Aluminum Foundry Co., Muskegon, Mich., died Feb. 20. Mr. Johnson was president of the company from 1927 until his retirement in 1953.

James S. McCulley, a retired superintendent of the former National Bronze & Aluminum Foundry Co., now Alloy Precision Castings Co., Cleveland, died Mar. 7. A native of Toronto, Ont., he went to Cleveland in 1903 and joined the foundry company soon afterward.

W. M. Reed, 63, founder and chairman of the board, American Air Filter Co., Louisville, died Feb. 2. He retired as president two months ago. While operating the former Louisville Auto Painting & Trim Co., Mr. Reed experimented with air filtering devices and in 1922 established Reed Air Filter Co., forerunner of American Filter Co.

Paul J. Froning, 69, for 33 years foundry superintendent, New Idea Division, Avco Mfg. Corp., Coldwater, O., died Feb. 5. Mr. Froning had planned to retire in June. Prior to joining the company in 1922, he was foundry foreman, St. Marys Foundry Co., St. Marys, O., and Minster Machine Co., Minster, O.

Gilbert E. Kempka, 28, chief metallurgist, Johnson Motors Division of Outboard Marine & Mfg. Co., Waukegan, Ill., died Mar. 3. A graduate of University of Wisconsin, Mr. Kempka was an instructor and did research work in metals at the university before he became associated with the Waukegan firm.

Herbert J. Oeser, 58, superintendent of the brass foundry, A. P. Smith Mfg. Co., East Orange, N. J., died Feb. 11. Prior to moving to East Orange in 1951, Mr. Oeser was associated with Brown Bros. Foundry Inc., Stamford, Conn.

Edgar A. Yeckley, 71, president, Lorain Brass Co., Lorain, O., died Mar. 10. Graduated from Pennsylvania State University in 1906, he was associated with various steel companies before going to Lorain 38 years ago.

Willam H. Bishop, pig iron salesman, American Steel & Wire Division, United States Steel Corp., Cleveland, died Feb. 11. Mr. Bishop had been with the Steel & Wire organization for the past 12 years.

Albert Christensen, 81, president, Christensen & Olsen Foundry Co., Chicago, died Feb. 18. He founded the company in 1922.

7 things to remember about BLASTRITE SHOT AND GRIT

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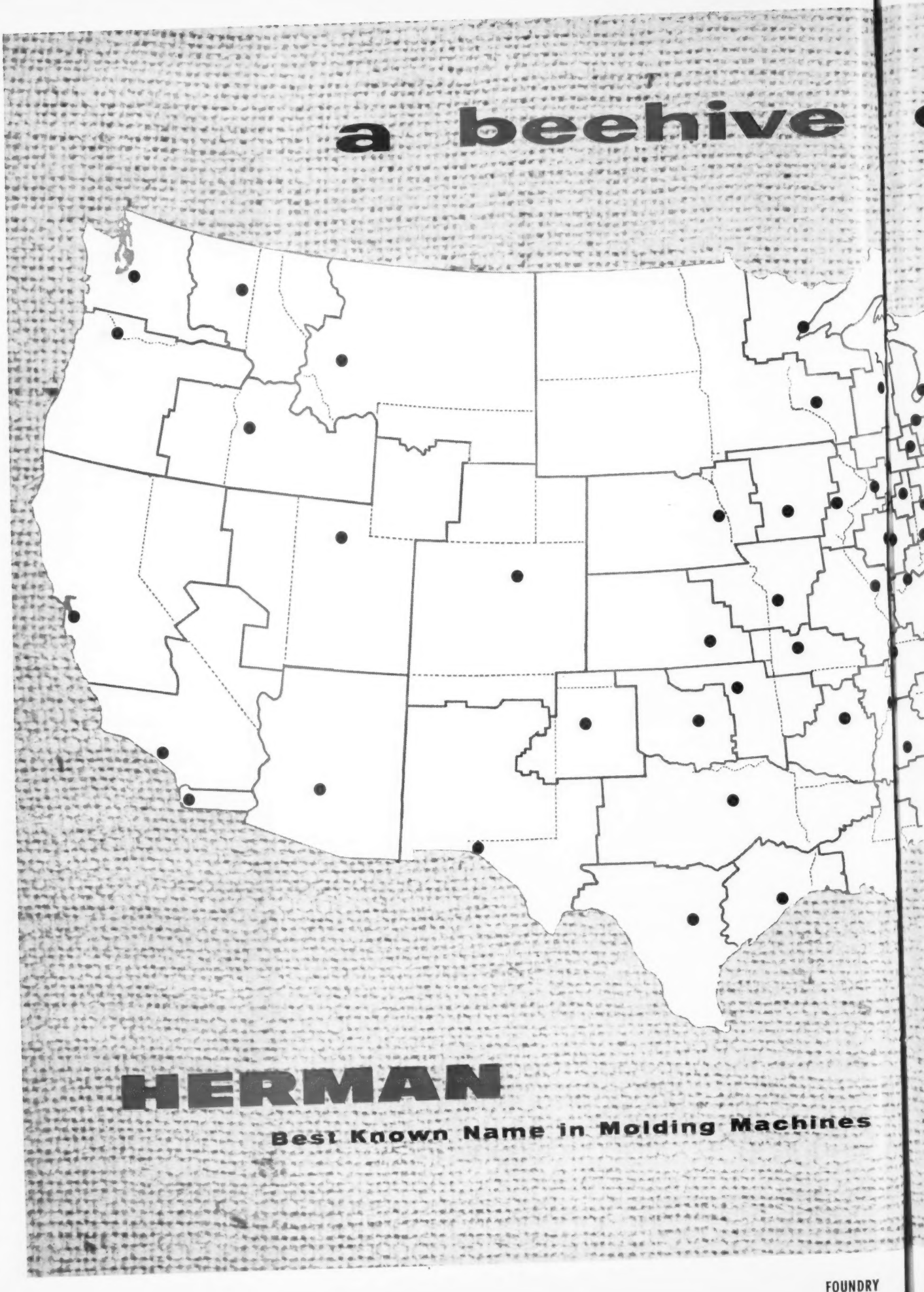
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HERMAN
Best Known Name in Molding Machines

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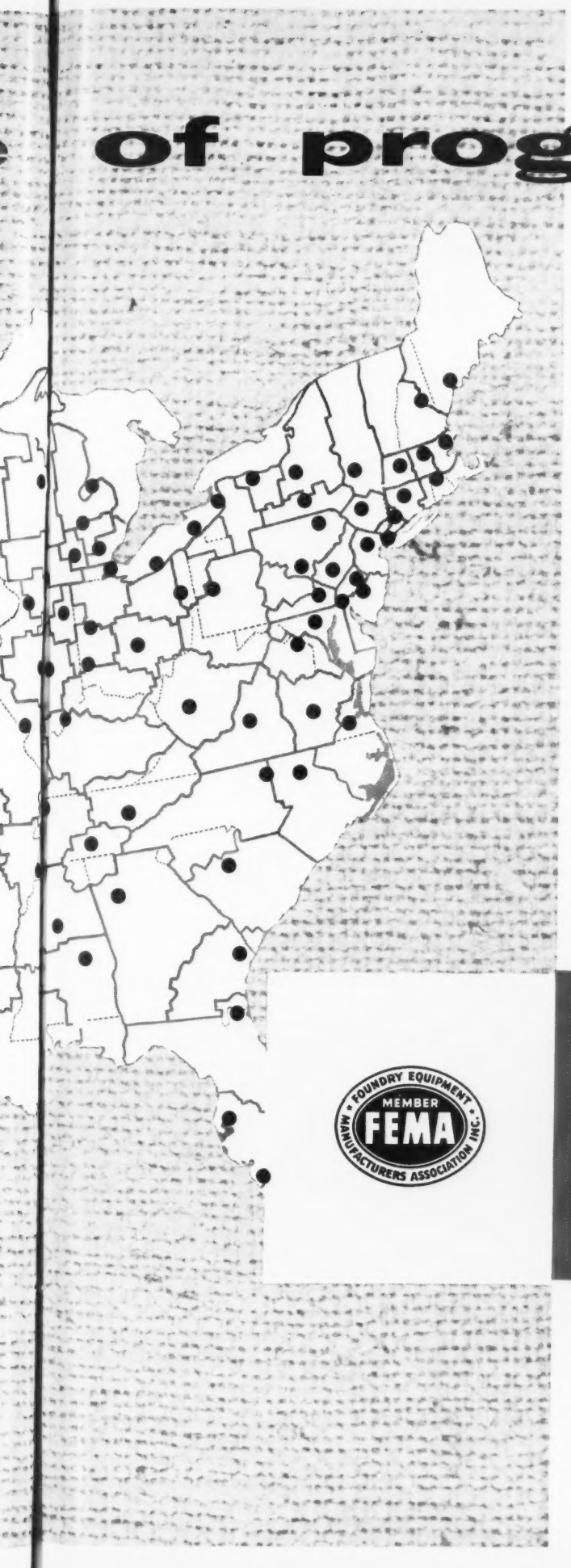


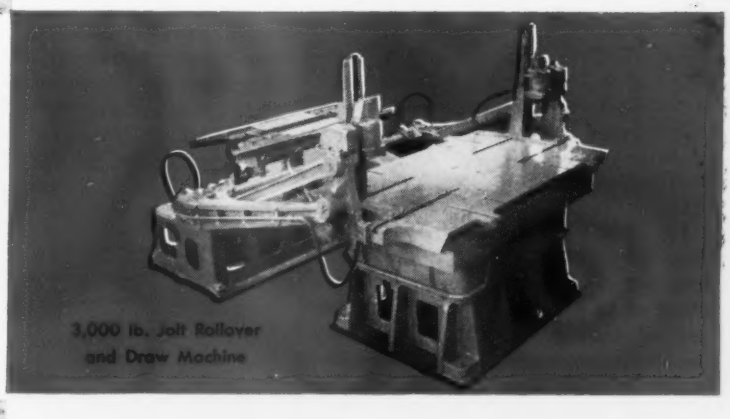
There are 96 primary distribution centers in the United States—industrial "beehives" meeting our nation's production needs—bottomless sources of sales potential.

How do the industries in these areas meet the ever-increasing supply demands? With up-to-date, time-saving techniques. How do they prepare today for the needs of tomorrow? With long-range planning and modernization programs. How do they provide increased production at lower cost? With equipment designed for progress and constructed for endurance.

Aggressive foundrymen like the manufacturers of railroad freight car wheels rely on Herman Molding Machines. Production of car wheel molds must be done on large equipment—750 lbs. of cast iron is poured into each mold. Yet, Herman Molding Machines are turning out one complete mold every minute.

Herman Molding Machines are built to withstand the rigors of the foundry industry and adapt to its changing conditions.

Write for further information.



3,000 lb. Jolt Rollover and Draw Machine

THE HERMAN PNEUMATIC MACHINE CO.,

UNION BANK BUILDING, PITTSBURGH 22, PA.

Man to Man

By RALPH L. LEE

Meeting the Challenge

"Size has nothing to do with getting ready for the future. Within his means and his opportunities, everyone can take the same steps"

AT THE BEST attended AFS chapter meeting in Detroit that I can remember, our well known foundry friend Jim Smith, who runs Central Foundry Division for General Motors, sure did himself proud recently when he spoke on "To Meet the Challenge." He also showed us his brand-new, colored, sound-motion picture of the same title.

If the rest of the persons in attendance got the bang I did from the performance, they must have left the meeting with jaws squared, shoulders thrown back and loins girded to meet the challenge of the future with vim and vigor.

After a review of the exciting progress Central Foundry Division has made to date, including any number of developments that seasoned foundrymen at first said couldn't be done, Mr. Smith told us of his organization's plan not only for continuing this rate of progress, but to speed it up to get ready to meet the greatly expanded demand for castings that he felt certain the future would bring.

As a prelude to just what these plans were, Mr. Smith explained one principal reason for his organization's progress to date—its established custom of taking the future seriously and doing something about it before it was in their laps. To this end, an organized method of stimulating suggestions long has been in effect.

In this special, future-tackling project, however, the department heads of all the foundries, including managers and other executives, were assigned a job. They were to set down in black and white what they were convinced a continued and accelerated rate of progress in their particular fields would require.

After these lists were in at headquarters, the central executive staff, in meeting after meeting, analyzed each proposal from every angle and either rejected or accepted it. These siftings, together with contributions from the staff members themselves, then were drawn up into a plan of strategy for attacking the future.

I had to think, as Mr. Smith unfolded this plan, how much a thing of the past, jealously guarded "trade secrets" have become. I will not even try to go into detail on each item as it was given to us—in fact, I couldn't if I wanted to, for I couldn't make notes fast enough.

(*For details of Mr. Smith's paper, see the complete text on page* 96. *Mr. Lee's column was prepared before he was aware that the entire paper would appear in* FOUNDRY.)

It was a wonderful meeting, and, as I said before, it left me with a high-voltage enthusiasm, a thrill of life along my keel for the future prospects of the foundry business and a determination to do things and go places—that is, until I remembered who I am.

"We haven't found anyone with nerve enough to push the button."

Facing the fact that I am president of the one-man Lee Hobby Foundry, I suddenly had a relapse. I muttered to myself, "Yeah, with astronomical sums of tons and fewer patterns than many a peewee alley shop, it's all very well to talk and plan on a grandiose scale. But what about all of us little fellows, who constitute the vast majority in this foundry business? What about us?"

Then, after I had reviewed quickly the items in Jim Smith's program, it dawned on me that outside of a few, there were no brand-new, earth-shaking innovations in the lot. What Central Foundry Division had done was to get the heads of the gang together, separate the present from the future and lay out a plan for going farther with what they already had used successfully—that is, doing more of what had proved good, and doing it on a definitely scheduled basis.

I perked up again at the thought that the little Lee Hobby Foundry can call a jam session of R. Lee, head of molding; R. Louis Lee, melter; Ralph Lee, pattern engineer; Ralph L. Lee, senior shakeout man; and, last but far from least, Mother (Mrs. Florence M. Lee, executive vice president and chairman of the board) and that within our means and opportunities, we could take exactly the same steps Jim Smith and his crew had taken.

Now that I think of it, size hasn't anything to do with getting ready for the future. As Boss Kettering always is saying, "You better *had* be interested in the future, for *you* are going to be in it." I'd like to add, with apologies to some ancient Chinese seer, "It is later than we think."

SWING ABOARD *Foundrymen!*

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Atlantic City, MAY 3-9

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- Is your design skill completely modern?
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- Can you manufacture a sturdier, more acceptable product?
- Are you familiar with the latest foundry developments?
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- Are you utilizing fully the results of research programs?
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The answers to these important questions may well represent important milestones along the Success Trail of every Progressive Foundryman. You can improve your personal score by making the most of the SEVEN EVENTFUL DAYS that the AFS Castings Congress & Show will be in progress . . . Atlantic City, May 3-9.

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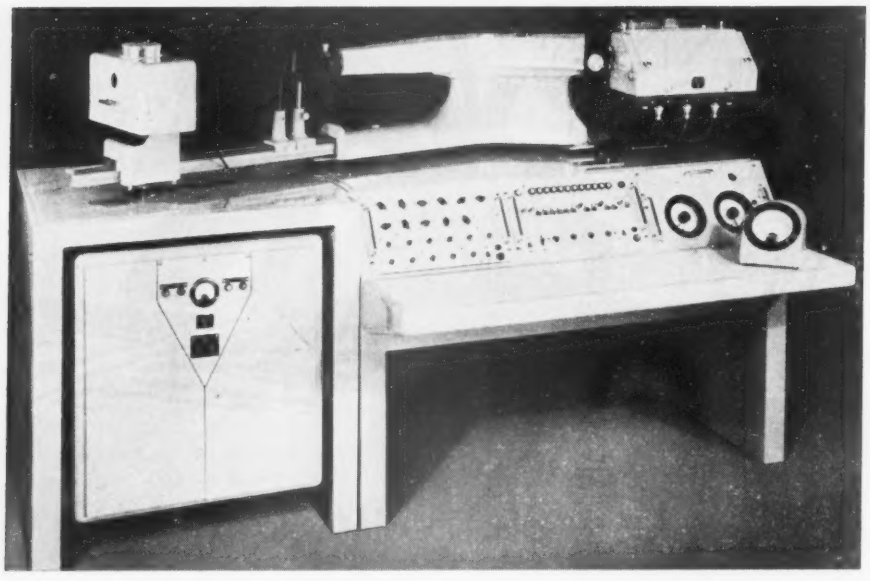
New Equipment and Supplies



Spectrometer

will analyze up to 11 elements in less than two minutes

Jarrell-Ash Co., 26 Farwell St., Newtonville, Mass. — Direct-reading medium quartz spectrometer will perform analyses for up to 11 constituents in two minutes or less with results indicated on a meter or a recorder. Analysis is simple and straightforward with minimum adjustment. Sample is inserted in arc stand and selector switches depressed. When spark button is actuated the integrating capacitors are grounded for about five seconds and the spark discharge begins. Integration starts and continues until the charge on the capacitor corresponding to the internal standard line reaches a fixed value. When integration is completed, spark is switched off and each of the selected channels is measured on a meter or recorder. Readings are converted to per cent composition by previously made calibrations with standard samples of known composition.

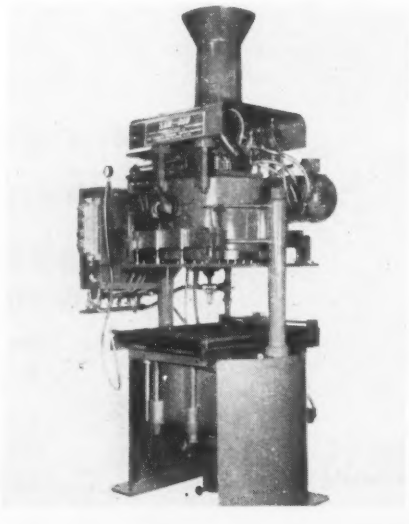
For More Details Circle No. 1—Page 187

Coreblower

can blow cores that weigh as much as 150 lb each

Federal Foundry Supply Co., San-Blo Division, 4600 East 71st St., Cleveland 5, O.—Coreblower features a stationary, automatic-refill sand chamber and is designed for blowing cores up to 150 lb each. Sand chamber is located directly under the sand hopper and has a shuttle type cutoff that automatically opens and closes for refilling after each blow. Sand chamber will accommodate 32 x 32 in. coreboxes. Standard equipment includes motor-driven plows in the sand chamber, roller conveyor frame for clamping table and single-pushbutton, automatic controls. Optional equipment includes pulsator type action for blowing wood coreboxes, low-pressure refill for minimizing corebox wear and vent plate assembly.

For More Details Circle No. 2—Page 187



Trowelling Resin

makes smooth pattern fillets and tools easily into place

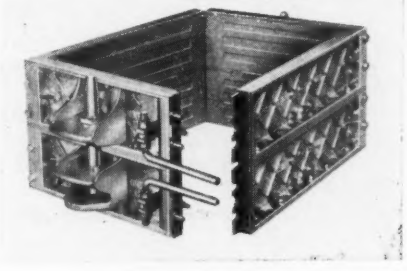
Marblette Corp., 37-21 Thirtieth St., Long Island City 1, N. Y.—Epoxy trowelling resin lends itself to making of smooth pattern fillets and matching and blending of radii. Resin can be tooled into place by spreading it over the pattern and making the fillet by use of a waxed, chrome-plated spherical ball. Resulting fillets are said to bond permanently without shrinkage and provide exceptional durability.

For More Details Circle No. 3—Page 187

Hinged Flask

features a positive, fast-acting, locking mechanism

Hines Flask Co., 3431 West 140th St., Cleveland 11, O.—Straight-wall, hinged flask is for hand and mechanical molding of loose, matchplate or



cope and drag patterns. Made of light-weight metal, flasks maintain alignment as they will not warp from absorbing moisture. Units are made with a positive, fast-acting, self-locking mechanism. To insure tightness when the flask is closed, only one adjustment need be made—drawing up the nuts on the locking assembly. Flasks are available in lengths and widths from 10 to 20 in., in even inches, with cope and drag depths from 3 in. up, in half-inches.

For More Details Circle No. 4—Page 187

Chilled Shot

available in 10 screened sizes annealed to proper hardness

Cedarville Foundry, P. O. Box 184, Cedarville, O.—Company's plant in Cedarville is producing a straight chilled gray iron shot while another subsidiary in Decatur, Ill., is producing a malleable chilled shot, annealed to proper hardness ranges. Shot is

For More Details on These Items
Use Reply Card—Page 187

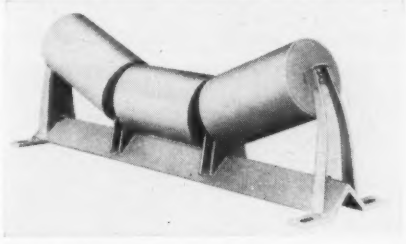
available in ten sizes and is packaged in double burlap bags containing 50 lb of shot. Delivery service from Decatur will be provided on orders of 12 tons or more.

For More Details Circle No. 5—Page 187

Belt Conveyor Idler

can be of greasable type or permanently sealed at factory

Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.—Ball bearing belt conveyor idler is available in a



greasable type with a "one shot" lubrication system serving all three rolls at once, and a factory sealed type that requires no further greasing. Rolls are made of a smooth, uniformly thick outer shell plus a heavy-wall steel center tube. Idlers can be supplied for seven belt widths from 14 to 36 in.

For More Details Circle No. 6—Page 187

Selector Switch

is for providing power to multifurnace melting units

Inductotherm Corp., 412 Illinois Ave., Delanco, N. J.—Selector switch is for applying power to multifurnace high-frequency induction melting installations. One selector switch is required for each furnace. Switches are mounted in the control panel and are water cooled to handle high currents. To prevent opening under load, they are interlocked with the controls.

For More Details Circle No. 7—Page 187

Cold Cure Binder

saves time in production and baking of sand cores

Archer - Daniels - Midland Co., Foundry Products Division, 2191 West 110th St., Cleveland 2, O.—Thirty per cent less baking time for foundry cores is claimed for new cold cure type binder. Additional savings are realized in reduction of coreroom time as the cores are said to be virtually self-ramming due to excellent flowability. Manufacturer says the binder is adaptable to large core work as the cores have required strength yet collapse easily. Material can be used with nearly all core sands. No special measuring or mixing equipment is required. Cores resist deformation during baking because they cold cure in the corebox. Normal wash procedures may be followed without causing any damage to the cores.

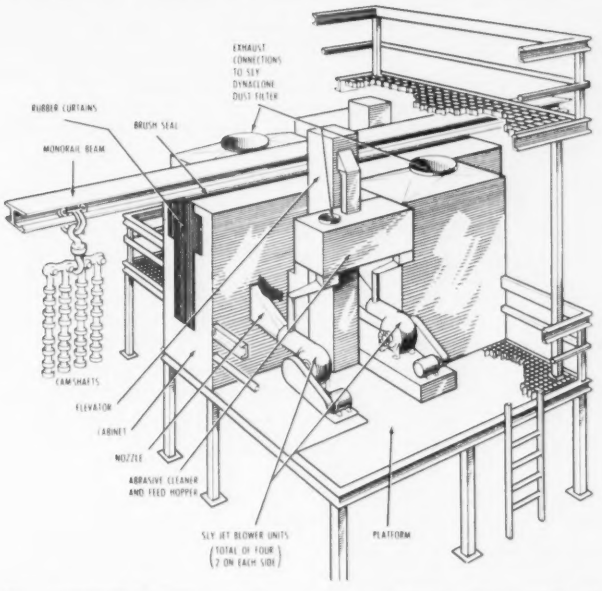
For More Details Circle No. 8—Page 187

Surface Agent

reduces foundry processing time and improves efficiency

Johnson-March Corp., 1724 Chestnut St., Philadelphia, Pa.—An anionic surface active agent can be used in foundry processes as a wetting agent, rewetting agent, penetrant, detergent and emulsifier. Fluid is a concentrated sulfonated ester type liquid which when mixed with core oils provides fast, uniform penetration. It can be used, according to the manufacturer, as an aqueous so-

Cleaning Method Utilizes Low-Pressure Blast



NEWLY DEVELOPED technique for cleaning shell mold castings is designed to direct abrasive under low pressure over entire surface of the casting, remove little or no parent metal, leave no pit marks on casting surface and prevent warping or distortion. Heart of the system is a small blower powered by an electric motor. Attached to the blower is a nozzle shaped to direct the air in the pattern required by the work. Cleaning abrasive is introduced directly into the nozzle. It does not go through the fan. As blast pressure is low, there is no compressor, no need for high horsepower.

Designed to clean shell-molded camshafts, the unit pictured here has four blower units, staggered up and down, two on each side of the cabinet. One unit cleans the top half, a second unit cleans the bottom half of one side. The other two units act similarly to clean the other side of the casting. Full use of abrasive is made by use of curved corrugated baffle plates at each blower unit. Nozzle openings range from circular to rectangular, to direct blast accurately. Blast direction can be adjusted at any angle from horizontal to vertical.

Same sand used in the shell mold can be used effectively as the abrasive in addition to standard sands, bonding sand, grits (from about G-40 and finer), and soft abrasives (nutshells, sawdust, or rice hulls). The unit is made by W. W. Sly Mfg. Co., 4702 Train Ave., Cleveland 2, O.

For More Details Circle No. 31—Page 187

lution in water systems to improve mulling time and efficiency. In slurry systems, the agent is said to give superior mixing and penetration with the least amount of water. Material is supplied in 55 gal drums.

For More Details Circle No. 9—Page 187

Core Vents

for CO_2 use are slotted to reduce frequency of cleaning

Carver Foundry Products Co., 1060 Hershey Ave., Muscatine, Iowa—Core vents contain slots that diverge toward the underface to prevent fine particles of sand from clogging the slots and eliminate the necessity of frequent cleaning. Self-cleaning feature reportedly assures continuous working of coreblowing and coreshooting equipment. Core vents have been widely used for the CO_2 process, according to the supplier. Vent is

strengthened at the center by a reinforcing ring on the underface. Vents over ⅝-in. diam have two such rings.

For More Details Circle No. 10—Page 187

Level Indicator

will function positively at bin temperatures to 300° F

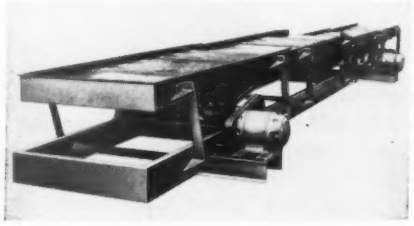
Fuller Co., Catasauqua, Pa.—Level indicator reportedly will function positively at bin temperatures up to 300° F and is suitable for all dry, pulverized, fine, crushed or granular materials. Indicator may be mounted vertically or horizontally. Manufacturer reports there is no danger of flowing material interfering with the mechanism or the motor.

For More Details Circle No. 11—Page 187

Screen Conveyors

permit tailor-made assembly of preparation installations

Williams & Green, Clearfield, Pa.—Balanced screen conveyors are constructed of heavy-duty, structural steel plate. With wire mesh, perforated plate, flange lip or other required screen dressing, they permit the assembly of tailor-made installations for materials preparation. Built to operate from existing power sup-



ply, screens are available in standard sections for fast conversion into screens, conveyors, picking tables, sizing or scalping screens.

For More Details Circle No. 12—Page 187

Compressor

is designed to operate under severe service conditions

Cooper-Bessemer Corp., Mt. Vernon, O.—Reciprocating compressor's capacity is from 100 to 300 hp and has use in foundries and metalworking plants where compressed air is used to actuate pneumatic machinery and portable tools.

For More Details Circle No. 13—Page 187

Speed Reducers

are shaft-mounted and require no flexible couplings or base

Dodge Mfg. Corp., Mishawaka, Ind.—Two shaft-mounted speed reducers have been added to company's line. One has a capacity of 60 hp at 100 rpm, AGMA rating, and can be mounted on shafts up to 5 in. in

diam. Other has a capacity of 1.3 hp at 100 rpm. No foundation, flexible couplings or sliding base is required for the reducers as they are mounted directly on the shaft. Unit is driven through a V-belt drive. Lock sheaves permit any speed ratio.

For More Details Circle No. 14—Page 187

Plastic Eyeshields

contain ventilating screen that stops fogging hazard

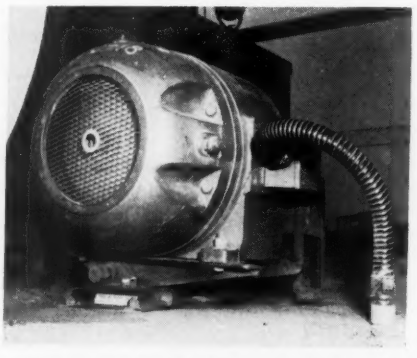
United States Safety Service Co., 1215 McGee St., Kansas City 6, Mo.—Protective flexible plastic eyeshields contain a nickel screen molded into the plastic frame to increase air circulation, reduce air traps and provide cool, fog-free ventilation. Entire unit weighs less than 2 oz. Prescription glasses can be worn comfortably under the eyeshields.

For More Details Circle No. 15—Page 187

Motor Base Mount

takes up belt stretch and automatically adjusts for tension

Murray Equipment Co., 11350 Schaefer, Detroit 27, Mich.—Motor base which requires no regular maintenance for proper drive belt tension



takes up belt stretch and automatically absorbs starting loads. When and if a belt needs changing the motor mounted on the base is tilted forward and blocked. Motor or belt realigning is eliminated as the base automatically adjusts new belts to proper tension. The base is available for all sizes from fractional to 200 hp.

For More Details Circle No. 16—Page 187

Conversion Unit

changes belt conveyors to permanent magnetic conveyors

Eriez Mfg. Co., Erie 6, Pa.—Unit converts existing belt conveyor lines to permanent, nonelectric magnetic conveyors by placing lengths of magnetic castings under the conveyor belt. Magnetic castings are 1 15/16 in. high x 4 in. wide, available in standard lengths of 3, 4, 5, and 6 ft. Other sizes may be ordered. Two magnetic strengths are made—one for handling ferrous objects of medium size as can covers, caps, and small stampings and the other is for handling unusually shaped objects where contact with the belt is small, where nonmagnetic and magnetic

HELPFUL
Foundry Literature

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FOUNDRY

INFORMATION SERVICE

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40. Coreblowers

Beardsley & Piper Division Pettibone Mulliken Corp., 2424 North Cicero Ave., Chicago 39, Ill.—Specifications and application information on line of coreblowers with capacities from a few ounces to 300 lb are found in bulletin 5000. Two core rollover machines and several pieces of mulling equipment of various capacities also are discussed. Bulletin also presents a section of tips on coreblowing with emphasis on equipment, venting and preventive maintenance.

41. Air Control Valves

Airmatic Valve Inc., 7317 Associate Ave., Cleveland 9, O. — Reference guide covers 17 different lines of air control valves and accessories.

42. Shell Mold Sand Test

Chemical & Metallurgical Division, General Electric Co., Pittsfield, Mass. —Issue 2 of company's "Foundry Facts" provides data on American Foundrymen's Society tentative tensile strength test for control of shell molding sand mixtures. Procedure to follow in performing the test is clearly outlined.

43. Product Directory

Allis-Chalmers Mfg. Co., 1032 South 70th St., Milwaukee, Wis. — A 4 x 9 in. directory of product literature—"This is A-C from A-Z"—provides an alphabetical description of company products and their descriptive literature. Booklet is introduced with a brief history of the company.

44. Hack and Band Saws

Capewell Mfg. Co., 60 Governor St., Hartford, Conn. — Three "How to Use . . ." booklets on hand hack saws, power hack saws and band saws are complete units in themselves and are written to provide an authoritative reference source relating to the selection and use of hack and band saw blades on various materials.

45. Mold and Core Spray

United Oil Mfg. Co., 1456 Walnut St., Erie, Pa.—Bulletin TB-1 describes foundry experiences with an air drying spray for green sand cores and molds. Spray is said to give excellent penetration and provide a resin-bonded surface which is firm and hard with clean, sharp edges.

46. Snagging Wheels

Electro Refractories & Abrasives Corp., 344 Delaware Ave., Buffalo 2, N. Y.—Bulletin GS-55 highlights advantages of various types of grinding wheels for use in steel mills and steel, malleable, gray iron and nonferrous foundries. Both resinoid and vitrified wheels are included.

47. Foundry Equipment

Sterling Wheelbarrow Co., Milwaukee 14, Wis.—Flasks for a variety of applications, clamps, clamping bars, pins and bushings, steel core plates, bottom boards, bands, upsets, slag buggies, wheelbarrows, core

trucks, casting carts and trucks, wheels and casters are illustrated in catalog 69. Specifications, engineering data and construction features are highlighted.

48. Epoxy Resins

Marblette Corp., 37-21 Thirtieth St., Long Island City 1, N. Y.—"Plastics in the Foundry Industry" provides step-by-step descriptions of working procedures for use with epoxy resins and other materials for producing loose patterns, match plates, core prints and core driers for dielectric baking. Instructions are given for using a gel-coat resin to patch worn metal coreboxes. Among types of molds described are those made from wood, plaster, metal, plastics, plastisol and glass.

49. Dust Collector

Green Fuel Economizer Co., Beacon, N. Y. — Bulletin 172-CFF describes a packaged dust collector so designed and assembled that it can be installed in any collecting system by the shop crew or a local contractor.

50. Air Filter

Emco Corp., 1319 Locust St., Des Moines, Iowa—Information sheet covers lightweight aluminum air filter that can be attached to any air tool. Air capacity is 1 to 20 cfm and unit will work with pressures from 30 to 170 lb.

51. Cut-Off Saws

Acme Saw & Mfg. Co., 1447 East 47th St., Cleveland 3, O.—Bulletin G-1 illustrates and describes gate and riser cut-off machines for aluminum, magnesium and nonferrous alloy castings. Three basic machine designs including radial, planer and boring mill types are available.

52. Molding Machines

Tabor Mfg. Co., Division of Turbo Machine Co., 840 West Main St., Lansdale, Pa.—Catalog 6 provides condensed basic information on molding and cut-off machines. Four cut-off machines are illustrated in addition to a series of plain jolt, jolt strip, jolt squeeze, jolt squeeze strip, jolt squeeze rollover and draw, and jolt rollover and pattern draw molding machines.

53. Classification Card

Ederer Engineering Co., 2931 First Ave. South, Seattle 4, Wash.—Crane classification card enumerates five crane service classes as established by NEMA and should be of interest to persons dealing with overhead bridge crane specifications.

54. Wire Rope Fittings

Thomas Laughlin Division, American Hoist & Derrick Co., St. Paul 1, Minn.—Engineering data, charts, dimensions and safety factors for fittings for chain and wire rope are shown in catalog 950-1.

55. Industrial Batteries

Electrical Storage Battery Co., Exide Industrial Division, Box 8109, Philadelphia 1, Pa.—Construction details on flat-plate batteries for industrial uses are shown in folder.

56. All-Purpose Hose

Manhattan Rubber Division, Raybestos-Manhattan Inc., Passaic, N. J. —General data on all-purpose hose described as suitable for use with air, oil, water and mild chemicals is offered in bulletin 7075.

57. Marking Dies

Jas. H. Mathews & Co., 3942 Forbes St., Pittsburgh 13, Pa.—Manual F-203 covers use and selection of steel dies for a variety of applications. Steel stamping, embossing and foil leaf marking dies, press-style type holders, tool post holders for marking around peripheries of cylindrical or round-tapered parts and numbering heads for embossing or debossing are illustrated and described.

58. Ramming Mix

J. H. France Refractories Co., 1944 France Rd., Snow Shoe, Pa.—Ramming mix with mullite base for industrial refractory linings where high resistance to molten metal and slag penetration is necessary is described in bulletin 810.

59. Palletized Molybdenum

Molybdenum Corp. of America, Grant Bldg., Pittsburgh 18, Pa.—Descriptive pamphlet explains system of providing molybdenum in burlap bags or can containers, palletized for ease of handling.

60. Abrasives

Industrial Metal Abrasives Co., 1603 Wildwood, Jackson, Mich.—File folder contains information on chilled and malleable grit, chilled, malleable and steel shot, replacement blades and malleable iron stars.

61. Power Wheelbarrow

Kwik-Mix Co., Port Washington, Wis.—Bulletin KM429 provides general information and highlights the

features of a power wheelbarrow with interchangeable attachments that permit loading, lifting or hauling all types of material with a single basic unit.

62. Precision Casting

Corning Glass Works, Corning, N. Y.—Catalog GC-2 explains in simplified form how Glascast powder is made into a shock-resistant, precision casting mold for high melting point alloys. Production schedules for pilot run quantities are given. Also included are detailed explanations on mixing the plasters for the basic molds and mixing the Glascast powder to form a suitable slip.

63. Plastic Blowers

Industrial Plastic Fabricators Inc., Norwood, Mass.—Technical specifications, performance tables and application data on polyvinyl chloride blowers designed to withstand most chemical fumes and polluted air in a temperature range of 40 to 140° F are found in bulletin 102.

64. Hoist Hooks

E. D. Bullard Co., 275 Eighth St., San Francisco 3, Calif.—Catalog illustrates and provides a full explanation of the uses of safety hooks on hoists and cranes. Data covers all types of hooks with safe working load capacities of 1000 to 50,000 lb.

65. Cold Cleaners

Manufacturers Processing Co., 1360 Hilton Rd., Detroit 20, Mich.—Performance and property chart covers five fast-drying, nontoxic, nonflammable cold chemical cleaners suitable to a variety of metal-cleaning operations of an industrial nature.

66. Metal Control

Herbert A. Reece & Associates, 960 Union Commerce Bldg., Cleveland 14, O.—Patents covering licensed methods and apparatus for producing controlled castings of specific mechanical properties, solidity, uniformity, machinability and economy are summarized in booklet.

67. Material Handling

Towmotor Corp., 1226 East 152nd St., Cleveland 10, O.—Three brochures covering fork lift trucks, tractors and accessories are aimed to help the busy executive choose the material handling equipment best suited to his own applications.

68. Portable Tools

Skil Corp., 5033 Elston Ave., Chicago 30, Ill.—Catalog of industrial portable power tools lists more than 100 models and accessories. Many of the tools are pictured with cutaway views to show construction details.

69. Equipment Catalog

Precision Equipment Co., 3736 North Milwaukee Ave., Chicago 41, Ill.—Lockers, storage cabinets, steel shelving, work benches, laboratory ovens, intercommunication systems and office furniture are illustrated and priced in catalog.

70. Solenoid Valve

Automatic Swith Co., 391 Lakeside Ave., Orange, N. J.—Form V5010 provides technical data on midget-size, solenoid valves that may be applied to any three-way valving requirements without any change of springs or other adjustments of any kind.

FOUNDRY

INFORMATION SERVICE

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71. Belt Conveyor Idler

Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.—Ball bearing belt conveyor idler, available in greasable and factory sealed types for seven widths from 14 to 36 in., is described in folder 2516.

72. Sprue Cutter

Keson Industries, P. O. Box 11, Berwyn, Ill.—Information sheet presents data on rubber sprue cutter that eliminates manual cutting of sprues.

73. Cast Iron Repair

International Nickel Co., 67 Wall St., New York 5, N. Y.—Nine case histories illustrating the repair welding of cast iron are found in booklet "The Repair of Cast Iron Parts."

74. Castable Refractories

North American Refractories Co., National City-E. 6th Bldg., Cleveland 14, O.—Bulletin 114 lists and

ADVERTISED PRODUCTS and SERVICES — **April 1956**

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This card good in U.S. and Canada only—Expires June 15, 1956

describes line of castable refractories particularly suited for use in linings of irregular shapes and dimensions.

75. Copper Dies

Beryllium Corp., Reading, Pa.—Folder on beryllium copper dies includes a section covering zinc die casting dies. Other subject headings are plastic molds and dies, forging dies, steel forming and draw dies and titanium forming and draw dies.

76. Screw Thread Inserts

Heli-Coil Corp., Danbury, Conn.—Size ranges, installation techniques and an application chart for inserts that provide female threads in die cast alloys, light metals, molded plastics and laminates are offered in bulletin 731.

77. Portable Lifts

Oster Mfg. Co., Box 4326, Cleveland 32, O.—Multipurpose, manually propelled, hand and battery powered hydraulic lifts with capacities from 500 to 2000 lb are illustrated and described in brochure.

78. Coal Dust Control

Wheelabrator Corp., 1102 South Byrkit St., Mishawaka, Ind.—Booklet 551-D discusses use of local exhaust ventilation and cloth-tube-type dust collectors for control of dust from coal and coke handling operations.

79. Testing Equipment

Claud S. Gordon Co., 3000 South Wallace St., Chicago 16, Ill.—Dimensions, operating principles, prices and general information on a variety of sand testing equipment are found in form 3600-55.

80. Metallizing

Metallizing Engineering Co., 1101 Prospect Ave., Westbury, N. Y.—Vol. 7, No. 11 of "Metco News" presents several case histories covering metallizing applications in which expensive equipment has been repaired at reported savings in time and money.

81. Mercury Vapor Lamps

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.—Booklet, "More Light for Less Money," describes applications of mercury vapor lamps in industrial plants, outdoors and in special situations.

82. Controller Parts

Brownell Distributors Inc., 306 Canal St., New York 13, N. Y.—Catalog and price list 55 contain a complete compilation of all renewal controller parts for electrical apparatus and motor controls made by the country's manufacturers.

83. Aftercooler

Niagara Blower Co., 405 Lexington Ave., New York 17, N. Y.—Functions of an aftercooler in removing moisture from compressed air and gas are described and illustrated with diagrams and photographs in bulletin 130.

84. Waste Treatment

Chain Belt Co., Milwaukee 1, Wis.—Bulletin 315-111 outlines equipment for coarse screening, grit removal, settling, skimming and flocculation treatment of miscellaneous industrial waste materials.

85. Plastics and Resins

Bakelite Co., Division of Union Carbide & Carbon Corp., 300 Madison Ave., New York 17, N. Y.—Condensed reference file on plastics and resins offers information about properties and uses of the materials in a variety of manufacturing processes.

FOUNDRY Reprints

86. Large Gray Iron Foundry

The Chevrolet Story is a 28-page detailed report on the Chevrolet Foundry, Tonawanda, N. Y. Coupled with many photographs and schematic drawings of various departments, the article fully covers each operation in this huge plant that pours more than 1000 tons of gray iron daily.

87. Magnetic Inspection

Magnetic Particle Inspection Standards by John B. Caine points out that lack of magnetic particle inspection standards drives some persons to insist on perfection. Author outlines what standards are required and are realistic. Acceptance or rejection of a casting should not depend solely on the presence of defects.

88. Automated Sand System

Production and Quality Raised by an Automated Sand System by I. H. Richardson describes an automated sand formulation, processing, handling and distributing system that has boosted one company's production per man on sand preparation by 800 per cent.

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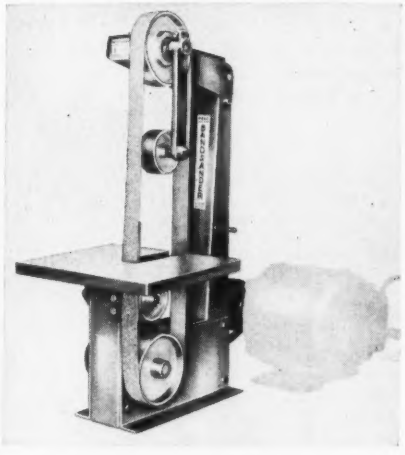
components are involved and on tangled masses or objects. Magnetic units are nonelectric, no outside power is required, no maintenance is needed and indefinite life is guaranteed.

For More Details Circle No. 17—Page 187

Band Sander

can be used for either inside or outside finishing work

Mead Specialties Co., Dept. B-8, 4114 North Knox Ave., Chicago 41, Ill.—Belt sander features quick belt changes, tilting table top, automatic



self-alignment of pulleys, automatic spring tension balance and ability to pass the belt through cut-out openings to sand inner edges. Model uses either 1 x 42 in. or 1 x 44 in. belts for both inside and outside grinding. Depending upon selection of proper grit, the sander can be used for roughing out coarse cuts or putting final finish on metal, plastic or wood.

For More Details Circle No. 18—Page 187

Dial Scales

are available in 36 models with capacities to 120,000 lb

Fairbanks, Morse & Co., 600 South Michigan Ave., Chicago 5, Ill.—Cabinet dial scales engineered to insure exact weight incorporate a direct-reading dial, a full swivel head, a cage-type central column construction and a controlled speed dash pot. Scales are available in 36 models ranging in total chart capacity from 500 lb by ½-lb graduations to 120,000 lb by 20-lb graduations.

For More Details Circle No. 19—Page 187

Burners

can be applied to radiant heating tubes in furnaces

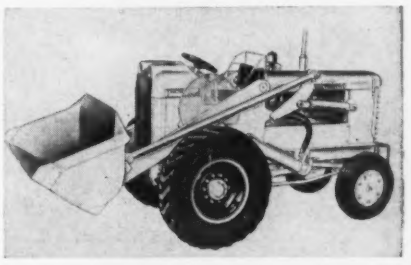
Eclipse Fuel Engineering Co., Rockford, Ill.—Radiant tube burners are designed for application to radiant heating tubes used in industrial furnaces and ovens for wide distribution of indirect heat. Burners operate on air pressure of about 8 oz and low gas pressure, normally below ½-lb. Burners are made in two sizes, and by use of adapter castings these two sizes can be used to fire radiant tubes with outside diameters ranging from 3¾ to 8½ in. Operating on 8 oz air, they will fire from 250,000 to 400,000 Btu per hr.

For More Details Circle No. 20—Page 187

Front End Loader

features front wheel drive and rear wheel power steering

Tractomotive Corp., Deerfield, Ill.—Front end loader of 1⅛ cu yd capacity features front wheel drive with rear wheel power steering. A 3:1 torque converter and clutch type transmission permits change of direction of travel without shifting gears. At normal carrying height of 3 ft, bucket can be tipped back to an angle of 41 degrees. At ground level bucket can be tipped back 22 degrees. Overall length with bucket in carrying position is 15 ft 4 in., permitting a turn in a 12 ft 3 in. radius.



Power is supplied by either a 63-hp, 4-cylinder gasoline engine or a 77-hp, 6-cylinder diesel.

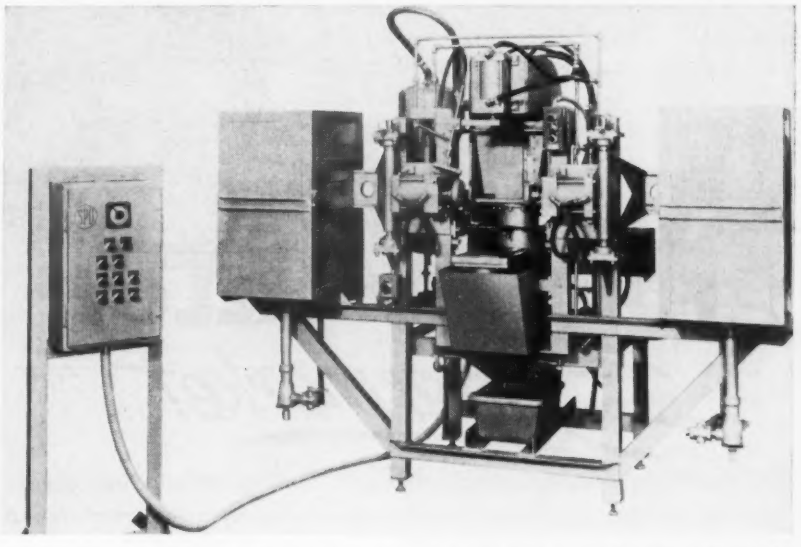
For More Details Circle No. 21—Page 187

Insulation Block

have strength to resist temperatures up to 2300° F

Carborundum Co., Niagara Falls, N. Y. — High-heat-resistant, lightweight, ceramic fiber block resists temperatures up to 2300° F. Block

Unit Blows Hollow Cores in 45-second Cycle



TWO-STATION hollow core-blowing machine requires only one operator and makes finished cores in a 45-second cycle without the use of driers or ovens. Unit will handle coreboxes measuring up to 10 x 16 x 20 in. Manufacturer reports that cores made by the machine provide these advantages: Easy shakeout, close tolerances in the casting, elimination of venting problems and fast curing. In addition, percentage of rejects caused by distorted cores is reduced to a minimum because hollow cores are not removed from the box or handled before curing.

Machine is equipped with twin ovens and twin corebox mounts which are pivoted to swing in a 180 degree arc between ovens and fill head located in the center of the machine. Both semiautomatic electrically-controlled and manually-operated models are available. In the semiautomatic units, all operations are automatic except positioning the coreboxes and removal of finished cores. These operations are performed manually by the operator. The machine is made by Spo Inc., 6448 Grand Division Ave., Cleveland 25, O.

For More Details Circle No. 32—Page 187

FOUNDRY ALLOY "Supermarket"

Get your handfuls to carload requirements of these, the principal foundry alloys of International Nickel Co., Vanadium Corporation of America, and Climax Molybdenum Corp. Fifty-eight alloys are "off-the-shelf" items from your nearest Whitehead warehouse. Each of these seven warehouses is well-stocked for prompt delivery with all standard sizes and forms. A call for quotation will convince you our prices are right, too. Take advantage of this easy way to order these quality foundry products.

Take advantage, too, of our technical service department. Our foundry engineers will be happy to answer any questions you may have, or otherwise work with you in anyway they can.

For higher quality castings, use higher quality alloying materials. And get them fast—Call Whitehead.

WHITEHEAD METAL PRODUCTS COMPANY, INC.

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has an approximate density of 2 lb per cu ft and is said to withstand flame impingement and to be unaffected by furnace atmospheres. Standard sizes of block are 12 x 12, 12 x 18, 6 x 18, 6 x 36 and 12 x 36 in. in thicknesses ranging from 1½ to 4 in. in ½ in. increments.

For More Details Circle No. 22—Page 187

Fork Lift Unit

can be fitted with attachments to perform many jobs

Kwik-Mix Co., Port Washington, Wis.—Three-wheel fork lift unit can be equipped with a double-acting hydraulic valve that enables the operator to tilt the mast and raise loads

with one hand. Mast can be tilted 10 degrees toward rear for better load balance or 2 degrees forward to aid in picking up or releasing a load. Standard forks are 30 in. long and adjustable from 6 to 32 in. in width. Rated lift capacity is 1000 lb with a maximum lift to a 6 ft height. Turning radius is 61 in. Fork lift attachment can be interchanged with a 10-cu-ft capacity hopper body, a 1500-lb capacity flatbed platform or a 5-ft scraper blade. Other attachments are available.

For More Details Circle No. 23—Page 187

Bonded Grinding Wheels

have long life and do not require frequent dressing

Clipper Diamond Tool Co., 21G West 46th St., New York 36, N. Y.—Bond for diamond wheels reportedly does not glaze even if carbide and steel are ground at the same time. Bond wets and adheres to each diamond grain regardless of how fine. After diamond is worn flat, a breakaway action will release the diamond particle and expose a fresh diamond

You'll find it HERE!

. . . just about every kind of grinding wheel you can think of . . . from the smallest mounted wheel to the largest roll grinding wheel. Simonds makes them all—all top quality and engineered for your jobs!

Get the Simonds Data Book and Stock List with Consumer Net Prices—and you're set to get the grinding wheels you need, quickly!

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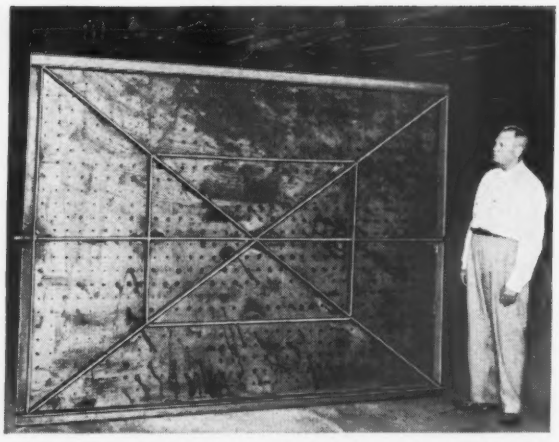
Division of Simonds Saw and Steel Co., Fitchburg, Mass.

HERE'S "TOPS" in BOTTOM BOARDS



Mighty BIG is this Sterling-made Bottom Board, and mighty well engineered . . . as all Sterling Core Plates and Bottom Boards are . . . to prevent warping or twisting. All welded steel heavy reinforcing angles and bars assure maximum strength and rigidity. This big bottom board suggests the versatility of Sterling foundry equipment engineers. Another reason why Sterling is "TOPS" in this field.

STERLING MAKES THEM THE WAY YOU NEED THEM

Standard Core Plate and Bottom Board Styles are available in various sizes. Special designs, including round bottom boards, can be made to meet your needs.

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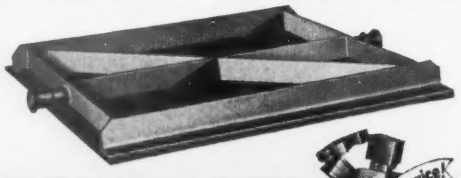

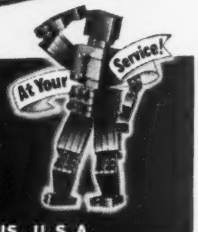

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Wood and Metal Patterns
18840 John R. St., Detroit, Michigan

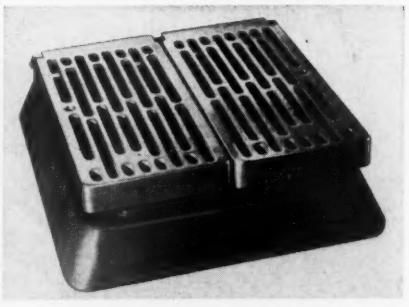
edge. Action continues throughout the life of the wheel so the grinding surface is always clean and sharp.

For More Details Circle No. 24—Page 187

Spray Dispenser

provides protection against spread of athlete's foot

Sani-Mist Inc., 1724 Chestnut St., Philadelphia 3, Pa.—Spray dispenser for use in locker and shower rooms



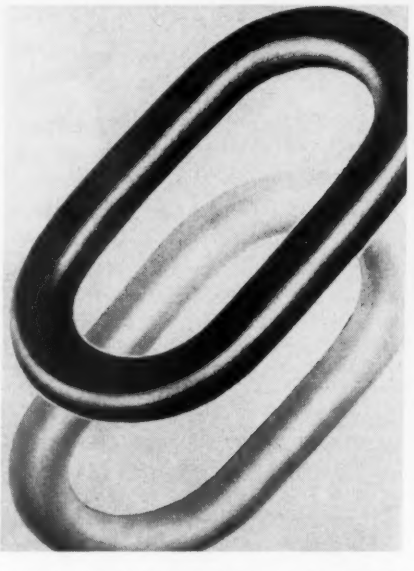
provides 6200 treatments for athlete's foot with one filling. Solution is placed in dispenser tank and is sprayed upon the feet automatically as an individual steps on the treadle. With the purchase of the solution, the dispenser is provided on a leased-no charge basis.

For More Details Circle No. 25—Page 187

Master Links

of alloy steel are for use with industrial slings

American Chain & Cable Co., 929 Connecticut Ave., Bridgeport 2, Conn. —Link for use with industrial slings

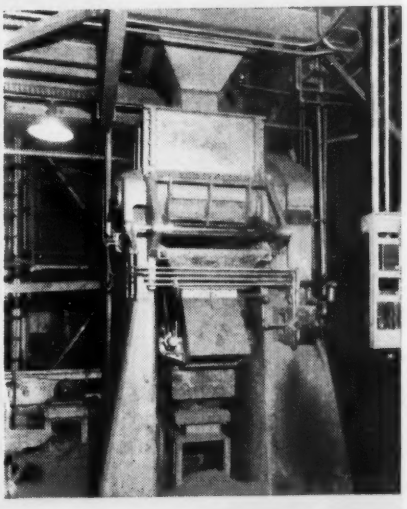


is said to hold its form under loads and stress 18 per cent greater when compared with links with a round section. Links are made of high-strength steel alloy and produced in sizes from ½ to 1¾ in. They are

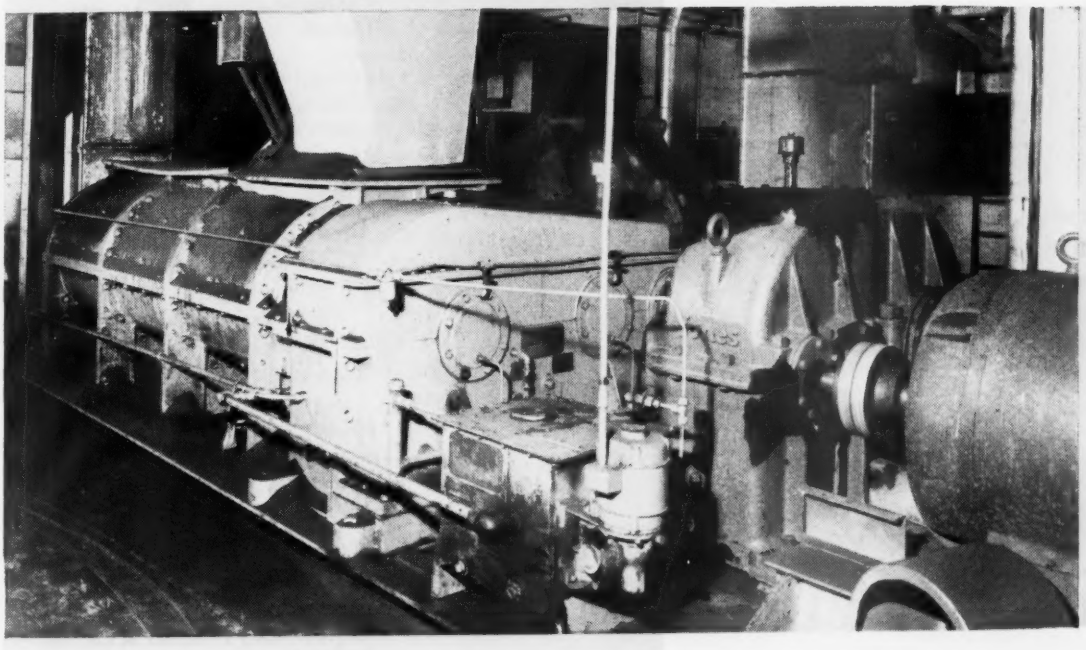
8 BAKER PERKINS UNITS

handle the sand mulling, core wash mixing, core paste mixing and refractory clay mixing in big new foundry

The eight Baker Perkins units installed in this new automotive grey iron foundry were chosen for their industry-proven excellence and efficiency. For sand mulling, five B-P 5A Continuous Molding Sand Mullers assure high speed delivery of thoroughly uniform sand mix to the molding floor. The B-P core paste mixer and B-P core wash mixer insure good core surfaces, and the B-P Refractory Clay Mixer is ideal for mixing refractory clay material for mudding up ladles and cupolas. This new foundry will find, as other foundries have found, that B-P equipment is built to last and requires minimum maintenance.



On the job . . . a size 15 B-P Refractory Clay Mixer



One of five B-P 5A Continuous Molding Sand Mullers installed in the new plant.

BAKER PERKINS INC.

CHEMICAL MACHINERY DIVISION, SAGINAW, MICHIGAN

For more information, use Reader Service Card, page 187

Use the new
Cleveland VG 2 Core Box
Vibrator.

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DRAW FASTER AND CLEANER
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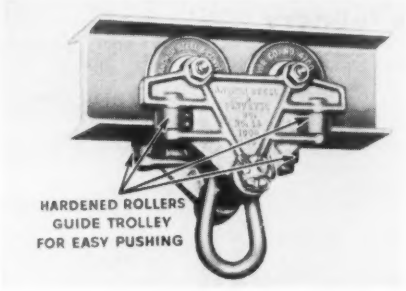
available as components for the company's slings, also separately for use with any make of chain or wire rope sling.

For More Details Circle No. 26—Page 187

Hoist Trolleys

are designed for hand pushing on monorail systems

Anchor Steel & Conveyor Co., 6906 Kingsley Ave., Dearborn, Mich.—Four-wheel hoist trolleys are designed for easy hand pushing on straight or curved monorail systems. Trolleys have 1000 lb capacity and contain ball bearing trolley wheels and hardened guide rollers. Trolleys are commonly used with hoists, tool balancers, welding transformers or for bridge crane end trucks. Company can also furnish straight and curved rail, track switches and completely installed monorail systems.



For More Details Circle No. 27—Page 187

Hose Fittings

are push-on type for low pressure applications

Flex-O-Tube Division of Meridan Corp., 2525 Jim Daly Rd., Inkster, Mich.—A push-on fitting is for low pressure use on machine tools or for shop air, water, fuel or lubrication lines and a two-bolt clamp fitting is for high-pressure, heavy-duty applications for hydraulic lines, steam hoses or liquid petroleum gas transmission. Push-on fitting is brass, comes in ¼, ⅜ and ½ in. sizes and

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NATIONAL BENTONITE is 90% montmorillonite and 10% minute fragments of other minerals."

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Na_2O	2.76%
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High-grade NATIONAL BENTONITE characteristics

Specific gravity of dried material	2.79
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Weight of pulverized material	61 lb. per cu. ft.
Weight of crude, crushed, undried material	80 lb. per cu. ft.
Refractive Index (mean, dried)	1.557
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is designed for use with rubber covered hose for a wide variety of low pressure uses up to 250 psi. Clamp fitting is made of heavy malleable iron and is secured by two large heat treated bolts.

For More Details Circle No. 28—Page 187

Blower

for oil burner operation can deliver 2650 cfm

General Blower Co., Morton Grove, Ill.—Blower turbo, designed for oil burner operation, is a 28-oz, 30-hp unit capable of delivering 2650 cfm.

Unit reportedly lends itself to multiple burner and multiple outlet applications. According to the manufacturer, the design encompasses a wide range of usage as pneumatic conveying of materials (where the materials do not go through the fan), burner applications and cupolas. When equipped with sealing devices the turbo may be used as a gas booster. It may be supplied with wheels of aluminum, mild steel or stainless steel.

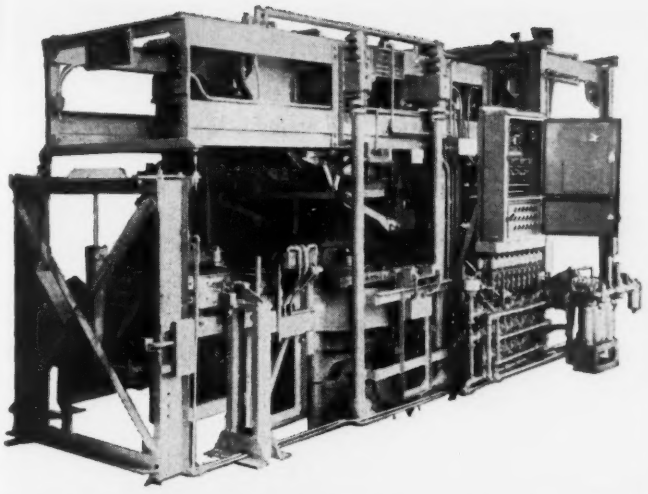
For More Details Circle No. 29—Page 187

Hoist Trolley

is lightweight and will fit a wide range of I-beams

Shaw-Box Crane & Hoist Division, Manning, Maxwell & Moore Inc., Muskegon, Mich. — Lightweight, heavy-duty, single-speed, pushbutton-controlled motor-driven trolley is for installation on electric hoists having capacities from 1000 through 12,000 lb. Trolleys are supplied in a variety of traverse speeds from 25 to 130 fpm, depending upon size and voltage requirements. Models meet all standard voltages. Trolley is available as a factory installed unit in combination with any model in company's line of hoists or can be bought separately in kit form.

For More Details Circle No. 30—Page 187



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"Push-Button" Operation Means The Ultimate in

INCREASED PRODUCTION . . .

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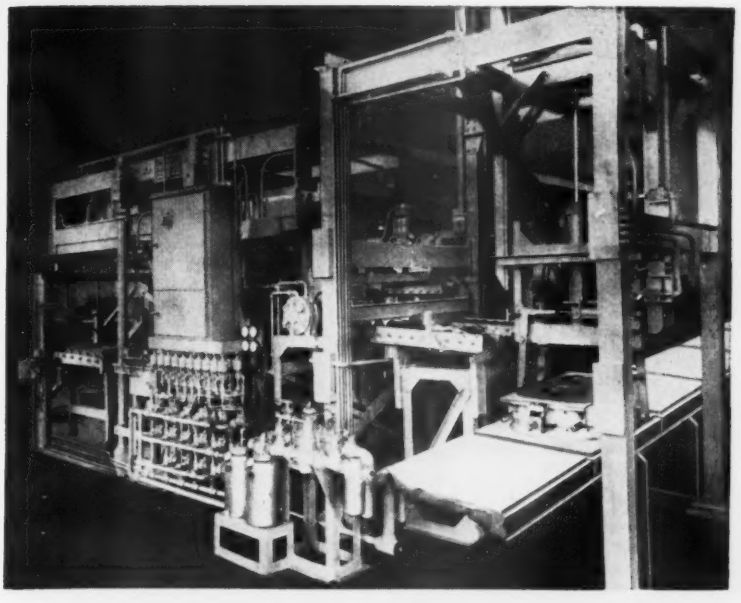

SHOWS COMPLETED MOLD AFTER BEING TURNED OVER, AUTOMATICALLY TRANSFERRED TO MOLD CONVEYOR. MOLDING CYCLE, 15 SECONDS.

Every Nicholls Molding Machine is precision-built to insure the production of *continuously* better molds. They eliminate guess-work and costly mistakes. They put an end to dangerous risks. They effect major savings in materials and maintenance costs.

This new #24 type C machine has a pneumatic pattern draw, is equipped with an air-operated car type squeeze head, built-in flask roll-in, roll-out device and a measuring sand hopper. Other Nicholls advantages include a flask indexing device and sand spill upset; flask feed-in elevator; mold turnover and transfer . . . PLUS full "push-button" automatic operation.

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Picture of a man about to cut GRINDING COSTS

He is checking up on the performance of grinding wheels in this foundry.

Is the rate of production high enough?

Are the wheels removing enough metal for the amount of wheel used?

Will the wheels stay sharp with a minimum of dressing?

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Around the Country

NEWS REPORTS FROM

Chicago . . . New York . . . Pittsburgh . . . Los Angeles . . . Philadelphia

New York— Gray iron production is moderately active with operations in most shops holding at around five days a week. Backlogs average perhaps four weeks. Demand is fairly diversified, with machinery and construction requirements outstanding.

Although independent brass shops are not busy, there is good demand from plumbing supply houses and others engaged in meeting requirements of the building industry. At the moment, however, there is little overflow from captive shops, in either light or heavy work.

In the heavier lines, activity is good in valves, pumps and ship propellers. Most aluminum foundries are busy, if not in aircraft work, in such items as components for oil burners, washing machines, meat cutters, etc.

Most brass and bronze shops are reported to be operating at 75 to 80 per cent of normal and most aluminum foundries at close to 100 per cent.

Pittsburgh— It's reported that price of foundry coke may increase soon due to the general price increase in coal. Beehive oven coke may also rise.

Foundries producing equipment for steel mills are working at capacity to satisfy need for current expansion programs. Captive foundries are particularly busy. Mesta Machine Co., producer of heavy machinery primarily for the steel industry, reports that unfilled business at the end of 1955 amounted to $91.4 million, compared with $29.6 million one year earlier. This is the largest backlog of unfilled orders in the company's history.

Mesta and other equipment builders believe operations will continue strong through 1956 and well into 1957.

A report of the Allegheny County Bureau of Smoke Control on progress in eliminating smoke in this area speaks critically of work done by the foundry industry. Reports the bureau, "Unless a greater effort is forthcoming from the foundry industry, it may become necessary to take some direct action to produce the results that we are all hoping to attain." Some small foundries are reluctant to invest the capital necessary for a complete smoke prevention system.

Chicago— Although prices of cast iron and steel scrap have retreated substantially from the fantastic levels to which they had surged early this year, foundries still consider them uncomfortably high. That's why foundrymen turn quickly to discussing scrap prices and supply when they come together.

Early in March, No. 1 cupola cast was selling at $47 a gross ton delivered in Chicago. This was $5 down from early January. Machinery cast at $52 was down $5 also, and 18-inch steel rails at $65 were lower by $6. But these March prices were still way above the market a year ago. No. 1 cupola cast is higher by $6, machinery cast by $7 and rails by $16.

In contrast, No. 2 foundry pig iron at $59 a gross ton fob furnace is higher than a year ago by only $2.50 a ton. Foundrymen have good cause to be concerned over the disproportionately increased cost of scrap. They are in a squeeze, since the competitive situation argues against raising prices on castings to the degree production costs have risen.

* * *

Of interest to foundries in the Midwest are recently announced expansion plans of Wisconsin Steel Division of International Harvester Co. and Interlake Iron Corp., both in South Chicago. The former sells a portion of its blast furnace ouput to foundries and the latter distributes all of its pig iron and coke to this market.

Among a number of improvements which Wisconsin Steel is making at its steel plant is relining and enlargement of its No. 3 blast furnace. Present annual capacity of 248,000 net tons will be upped about 25 per cent.

Last May, Interlake Iron started construction of coke ovens and auxiliary facilities. The 50-oven battery is scheduled for completion this summer. Announced in February is further modernization and expansion to cost $15.9 million. The improvements will include construction of a second battery of 50 ovens and a high-level conveyor bridge across the Calumet river, connecting the company's coke plant with its blast furnace facilities.

The bridge and its approaches will be about two-thirds of a mile long, 125 feet above the river. A belt conveyor will be capable of moving more than 100 tons of coke an hour. Coke now is transported by circuitous rail routes.

The coke ovens, together with the battery now under construction, will replace 120 old ovens. The 100 new ovens will increase coke capacity 40 per cent. Other phases of the modernization program include a new coke screening station, a central boiler plant and enlarged coal chemical facilities.

Los Angeles—Foundrymen anticipate an active market through the spring and early summer months. This condition is indicated by a rising volume of inquiries and orders from a wide variety of castings consumers, including the aircraft industry. Aluminum and brass foundries report that aircraft orders for new casting designs are nearing an all-time high, assuring that the Defense Department's dispersal policy is no longer having such a frightening effect on the industry.

Inquiries are so heavy that steel foundrymen expect their first half business to be 15 per cent better than that of the same period in 1955. To reach this increase, foundries say they must turn 25 per cent of new inquiries into sales. The average is approximately 33 per cent, they say. "If inquiries continue to come in like this, we'll transform our sales department into an order-taking desk," one foundryman said. He added, however, that the sudden interest by consumers is not natural for this

time of year, and a leveling-off period should come before long. The hope is that the activity will be strong enough through spring to carry into the usually slow summer months.

Foundrymen are looking toward the June elections with trepidation. Already two candidates for the County Board of Supervisors—the organization most closely connected with smog control—have indicated they will build their campaign around the smog issue. Among other planks in their anti-smog platforms, the aspirants say they will advocate barring new industries in the Los Angeles county area until the smog situation is relieved. If successful, this demand will negate the City Council's plan to rescind the city's ancient 13-story building limit. By removing the lid, the Council had hoped to entice new industry into the area. Observers foresee another bitter city-county dispute over the matter, with the anti-smog forces marshaling their big guns against industry.

In line with this belief, smog control boss Smith Griswold told a meeting of industrial leaders that "smog is going to get worse before it gets better." Several foundrymen indicated that they feel this statement is "an effort to alibi an advance" for expected heavy smog attacks in the summer. "You can be sure that we'll be the goat again," one foundryman said bitterly.

Philadelphia— Foundry business continues at a good, steady pace. In gray iron, the emphasis is on heavy work, particularly automotive dies and certain types of industrial machinery. Beloit Eastern Division of Beloit Foundry Co., Beloit, Wis., at Downingtown, Pa., is expanding equipment facilities to meet heavier demands for papermaking machinery. Textile machinery shops in eastern Pennsylvania are operating well.

Also active are the pressure and soil pipe foundries, building up pipe inventories for the spring building season. Light work, while not as active as the heavier, is nevertheless well sustained. Most gray iron shops are operating on a full five-day-a-week schedule. Delivery promises range four to five weeks.

Malleable shops are especially busy on hardware castings and pipe fittings, and there is a slight improvement in railroad demand. Only in automobile castings does there appear to be a lag, and this may be temporary. Practically all malleable shops are running close to 100 per cent of normal capacity, with backlogs extending six weeks and longer.

Steel foundries are operating five days a week on diversified requirements. Backlogs average five to six weeks. Brass and bronze shops are only moderately busy, although there is good business in builders hardware and some improvement is noted in maritime requirements. These foundries are operating close to five days a week, but not necessarily with full working forces.

Barring malleable grades, cast scrap is in adequate supply, with prices slightly easier. Also, pig iron supply represents no important problem for district foundries.

The Brinton Foundry and the Foundry Division of the Fletcher Works, both of Philadelphia, have been consolidated, and all work at the Brinton plant has been transferred to the Fletcher shop for production.

Kolcast Industries Moves

Kolcast Industries Inc. has moved its general offices from 16601 Euclid Ave., Cleveland, to 36101 Euclid Ave., Willoughby, O.

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In non-ferrous melting operations, Mullitex, Dry Press Process, Missouri Quality Fire Brick has demonstrated its superiority by actually producing increases in service life up to 100%.* Not in one single instance on record has Mullitex failed to show an appreciable increase in length of service.

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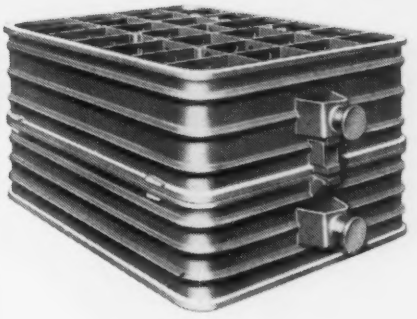

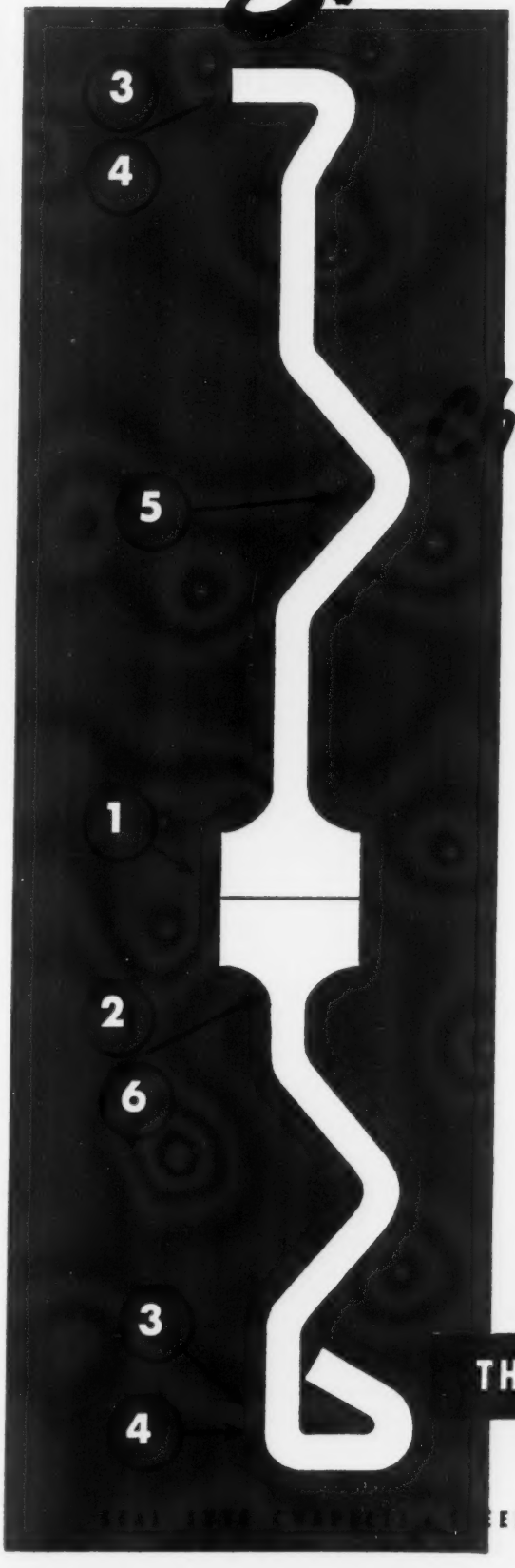

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Check These Advantages

1. *You are not limited on flange width or thickness.* Your bearing surface may be as wide or as narrow as you wish.
2. *You are not limited on the amount of sand lock.* Shanafelt welded flanges can be placed for any width sand strip—or none at all.
3. *No unnecessary weight or cost.* Flanges can be welded on all surfaces if wanted but, if heavy flanges are not necessary opposite the parting, use the economical and weight saving Shanafelt formed flanges.
4. *Formed flanges opposite the parting can be turned either in or out* to suit your requirement, or made in the special formation as illustrated.
5. *Sidewall corrugations add strength to the flask* without increasing weight or cost.
6. *No skip welding.* Automatic welding equipment assures strong continuous fillet weld.
7. *Sidewalls of copper bearing, rust resisting steel,* rolled specially for Shanafelt flasks.

It will pay you to investigate this latest style Shanafelt heavy duty flask. You will find it strong, durable, and reasonably priced. Quotations of cost and weight will be submitted promptly upon receipt of your inquiries. Technical Bulletin F-10 shows details of all styles and sizes of Shanafelt Steel Flasks. We would like to supply copies to all members of your organization who are concerned with your flask equipment.

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EL FOUNDRY FLASKS • FLASK PINS AND BUSHINGS

Banquet Speaker C. E. Irwin, Michigan State College, left, with P. C. Fuerst, Falk Corp., conference head

WISCONSIN CONFERENCE

Highlights Progressive Practices

By EDWIN BREMER, *Metallurgical Editor*, ROBERT H. HERRMANN, *Associate Editor* and ERLE F. ROSS, *Chicago Editor*

Left to right—Dean K. F. Wendt; Prof. G. J. Barker, conference chairman, and Coach Milton Bruhn, speaker at the Thursday luncheon. All are from University of Wisconsin

ANOTHER successful regional foundry conference was conducted in Milwaukee, Feb. 9-10. This, the 19th annual event sponsored by the Wisconsin Chapter, AFS, and the University of Wisconsin, was held at Hotel Schroeder with an attendance of 775.

The program featured two general sessions, 20 technical sessions, two luncheons and a banquet. Technical sessions dealt with steel, gray iron, malleable, nonferrous and pattern practices.

Wisconsin Chapter President, P. C. Fuerst, Falk Corp., Milwaukee, opened the conference. He was followed by Kurt F. Wendt, dean of engineering, University of Wisconsin, who spoke on **Responsibility of Engineers.** The work of engineers in our modern civilization seldom is questioned as to its adequacy, safety, and reliability because their record of performance is high. That is the highest tribute that can be paid. Engineers cannot compromise with quality; they must continue to use their know-how to improve existing materials and to develop new. To do that, young men must receive good engineering training.

Hans J. Heine, technical director, AFS, Des Plaines, Ill., spoke on **New Horizons in Foundry Progress.** Foundrymen, today, face the unprecedented challenge that they must apply all present and future advances in processes and materials.

Those include vacuum melting—just on the threshold; metallurgy—small additions of some elements to certain metals may bring improvements in physical properties; vacuum degassing—it will find practical use in both small and large shops; high pressure molding—gives high reproducibility of results; shell molding—although the present concept is the same as it was originally, shell cores may assume greater importance than shell molds, and the CO_2 process for hardening molds and cores—this likely may be one of the important developments of the decade.

Foundrymen must learn to modify and adapt processes to their own requirements. This flexibility must apply to management techniques as well as to materials and processes. State laws may become more stringent in safety, hygiene and air pollution, and foundrymen must be prepared to co-operate.

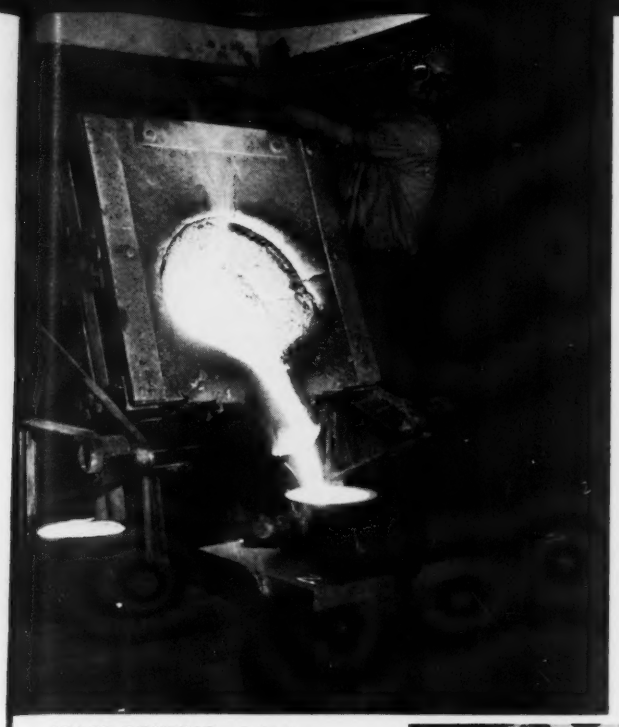
Noise, a Problem in Industry was discussed by H. J. Weber, director of safety, hygiene and air pollution control, AFS. He covered legislative trends, cost of noise control and the problem as it concerns foundries. If the courts uphold decisions that have been rendered, compensation to workers for loss of hearing could dwarf all other industrial health claims.

Foundries have constant noises like the roar of furnaces and intermittent noises generated by friction, conveyor belts, air compressors, chipping hammers, and other tools. Many exceed the desirable level.

Prevention is the best control, but that is not always possible. Mr. Weber suggested steps a foundry should take to guard against unjust claims from employees for ear damage. They are periodical physical examinations including an audiogram for workers. Also management must insist that workers wear protective devices for the ears.

Speaker at Thursday's luncheon, Milton Bruhn, head football coach, University of Wisconsin, described numerous incidents which played an important part in the outcome of football games. He then talked about prospects for Wisconsin's 1956 squad, and expressed the opinion that the outlook was excellent for a good year.

Dr. Charles E. Irvin, Michigan



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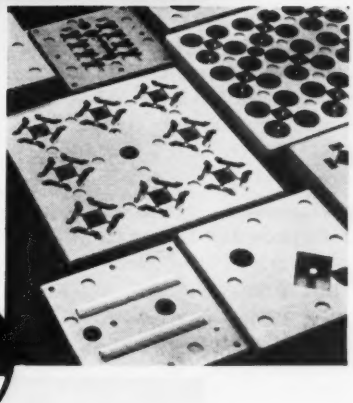
STACK POURING of Alnico magnets, 12 to 16 high. 2% of resin produces necessary *high strength*, saves time and space.

BLOWN SHELL CORES. *Non-segregating* qualities lend themselves perfectly to shell and core blowing techniques.



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- ✓ **ECONOMY** . . . Foundries using the PlastiSand Process report superior molds with as little as one-half the resin content formerly necessary with dry resin.
- ✓ **SHORTER DWELL, FASTER CURE** . . . Less time on the pattern and a faster baking cycle means more production.
- ✓ **NON-SEGREGATING** . . . Each grain of sand is completely and uniformly coated with liquid phenolic resin in the PlastiSand Process.
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- ✓ **SUPERIOR TENSILE STRENGTH** . . . PlastiSand molds have much greater cold strength, a factor gaining importance as new stack pouring techniques are developed.
- ✓ **DUST FREE** . . . An invaluable safety and health factor. The absence of dust means healthier working conditions, no irritating dust fumes, no danger of dust explosion.
- ✓ **NON-CLUMPING** . . . Sand, treated with the PlastiSand Process is always free pouring—regardless of temperatures.
- ✓ **GREATER PRODUCT UNIFORMITY** . . . Resin-coated sand prepared by the PlastiSand Process yields almost identical molds, batch after batch.

This informative booklet may be obtained by writing to Acme Resin

The PlastiSand Process, utilizing liquid-resin coated sand in shell molding, was introduced to foundrymen 4 years ago. Before it was offered to the industry, the process was tested in numerous foundries, large and small, so that every advantage claimed for it could be double checked and proved.

Now, after 4 years, with the PlastiSand Process in use in over three hundred foundries, the Acme Resin Corporation not only repeats these claims, but, from reports from these foundries, has found the advantages to be more positive than when originally offered.

With the increased use of the PlastiSand Process in the United States and its acceptance by foundries in Canada, England, Germany, Austria, France, Italy and Japan, Acme Resin Corporation is increasing its production capacity with new plants in Massachusetts, California and Canada.

The PlastiSand Process is adaptable to dump-box, roll-over and blowing of either shells or cores.

Resin formulation and the coating process covered by Patents 2,706,163 and 2,706,188

ACME RESIN CORPORATION

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State College, addressed the conference banquet on **A Management Is as Good as Its Words.** Communication is of great importance to industry. Most industry communicative efforts suffer from three faults: Impatience—failure of management to do enough precommunication thinking; impenetrability—intentional confusion, gobbledegook; and imposition—unnecessary bulk. Written communication should be accurate, brief and clear. Spoken communication should be instructive, interesting and inspirational.

At the Friday luncheon Vernon Thomson, attorney general, State of Wisconsin, spoke on **Wisconsin—Laboratory of Government.** He described Wisconsin political and social developments since the early years of statehood.

Malleable Iron—Lyle R. Jenkins Wagner Malleable Iron Co., Decatur, Ill., spoke at the first session on **Processing of Pearlitic Malleable.** Two primary requirements are needed to produce high quality pearlitic malleable.

The first need is for a high degree of technical talent to understand, and solve production problems as they arise and to improve the process and quality of the product. The second is the use of properly designed and operated equipment to maintain uniform quality, production rate and metallurgical control.

Processing pearlitic malleable requires closer control than does standard malleable. Mr. Jenkins discussed melting variables, covering control of carbon, silicon, chromium, boron, manganese and phosphorus. The proper heat treatment of pearlitic malleable also was discussed.

At the second session, R. J. Mulligan, the Archer-Daniels-Midland Co., Minneapolis, spoke on **Casting Scrap Due to Cores: Cause and Cure.** The speaker placed core defects into seven classes: Blows, cracks and hot tears, erosion (cuts, washes, and scabs), metal penetration and rough surfaces, deformation and warping, and veining.

Corrections for defects often are diametrically opposed, and compromises must be used. One example is elimination of hot tears and erosion. The former requires less hot strength and higher hot deformation; the latter requires opposite corrections. Proper handling and preparation of cores and mold surfaces are important in reducing defects.

The Duplex Method of Melting was discussed by Eric Welander, John Deere Malleable Works, Deere & Co., Moline, Ill., at the third session. Duplex melting provides a constant source of molten metal at a lower cost than cold melt process. However, it requires a large capital expenditure which makes small tonnages uneconomical. Savings of 20-25 per cent in fuel and 36 per cent in labor were cited for duplex over cold melt at John Deere.

Although initial and operating costs of an air furnace are less than for the electric furnace, the flexibility of the arc furnace often is the deciding factor for using it. Ability to hold molten metal for extended periods was cited, as well as the elimination of shortage or overage of metal at the end of the day's pouring.

Use of proper raw materials and fuel and close process control are important from the standpoint of quality and costs.

At the concluding session Cy Semrau, Hill & Griffith Co., Cincinnati, spoke on **Scrap Reduction Methods.** Scrap reduction requires application of quality control methods to the production of castings. For best results accurate records should be kept on each operation. Proper evaluation and use of information on the records is essential. No foundry is so small that some type of control cannot be established with beneficial results.

Scrap often is generated by equipment in poor condition. Regular inspection and maintenance of machines, flasks, jackets, etc., is mandatory if they are to function properly. Tendency of crowding as many patterns as possible on a plate is bad practice. It not only interferes with proper gating, but also causes numerous casting defects.

Steel—Speaker at the first session was Clyde Sanders, American Colloid Corp., Chicago, and his subject, **Casting Surface, Finish, Tolerance and Precision.** Competition has driven most foundries to the matter of finish with demands that are unrealistic. Sand controls finish and unless fine sand is used, smooth finish in steel, malleable or gray iron is unattainable.

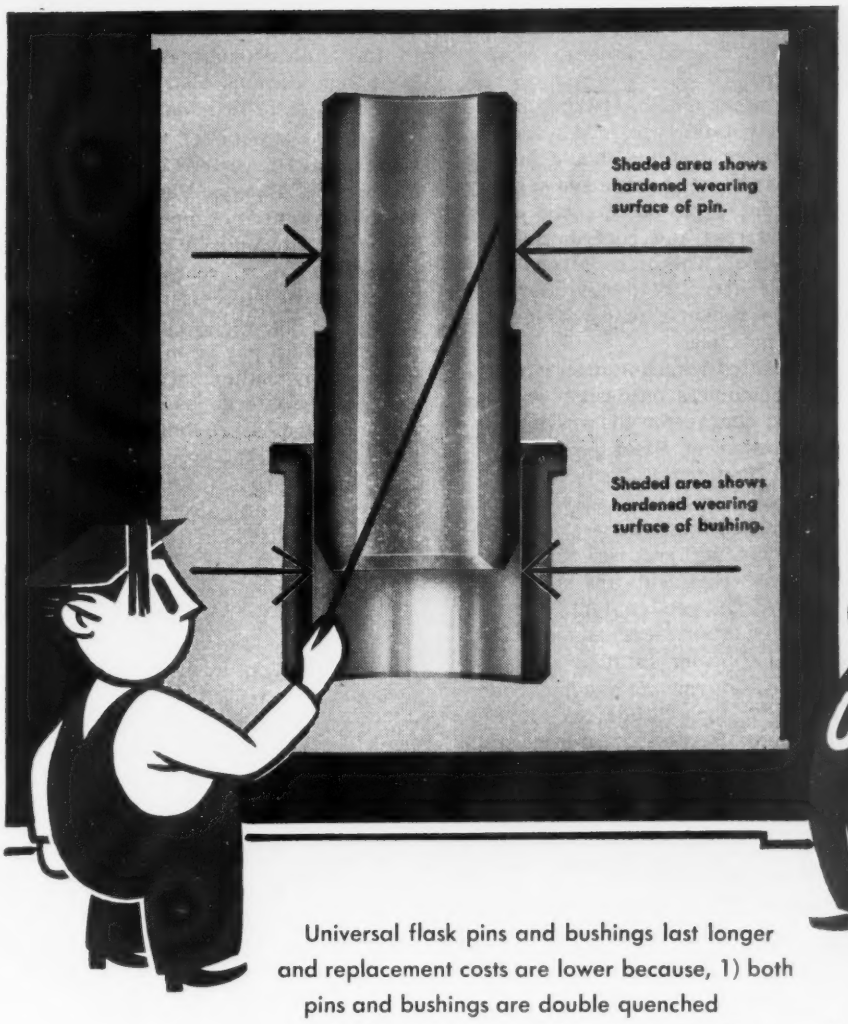
"Tolerance" and "precision" claims for shell molding and other new commercial processes have got out of hand. Logical considerations in selecting a molding process are: Unit costs of equipment and materials, cost of a finished mold, required precision, controls needed, competitors' selling price, will a few thousandths more metal be more difficult or costly to remove, are castings to be welded, are they to be annealed, are they to be straightened and what cleaning is involved?

Other important points are that a casting is only as good as its pattern. Fine finish castings can be made in fine green sand, and the molder has much to do with the precision attained in the casting.

At the second session, W. G. Rinehart, Harnischfeger Corp., Milwaukee, discussed **Welding in the Foundry.** Almost any steel can be welded. Tensile strength of welds from 60,000 to 280,000 psi can be achieved, although the latter still is experimental. The performance of electrodes is attributed to coatings which shield the arc and prevent oxidation. Among the newer coatings are low-hydrogen types, which contain calcium carbonate and coatings to which iron powder has been added. No electrodes are made specifically for steel castings. It is the practice to use those developed for some other application.

Welding troubles multiply as the carbon in the base metal is increased above 0.25 to 0.30 per cent. Carbon can not be added to electrodes as it can to castings. High strength

L. F. Krueger, Pelton Steel Castings Co., ticket committee chairman, looks on as B. H. Booth, Carpenter Brothers Inc., conference treasurer, sells a book of admission tickets to J. S. McKelvey of General Refractories Co.



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185

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For more information, use Reader Service Card, page 187

weld metal is obtained from alloys in electrode coatings.

In welding practice, underbead cracking results from hydrogen in the atmosphere and lack of preheat in the base metal. The amount of preheat required goes up with base metal tensile strength. In all cases, preheat should be maintained during welding.

Striking an arc on the casting being welded is as bad as notching the casting. A crack can start from the indentation created.

Magnetic Particle Inspection of Steel Castings was covered at the third session by Frank S. Catlin, Magnaflux Corp., Chicago. He was assisted in the question period by Ross Shader of the same company. Foundries must educate customers to better stress design and more realistic specifications.

Castings correctly designed and shaped to do the job intended have great competitive advantages. Unfortunately, however, not all parts are designed; frequently they are merely drawn up. As a consequence, they are unnecessarily complex, with ribs, sharp corners and cavities. They often look clumsy and are difficult and expensive to cast.

Experimental stress analysis of a casting will reveal how and why stress is concentrated and will point to the usually simple changes of shape that can be made to correct the design.

Since breakage of parts is the most likely failure to affect service, good foundry practice should include an evaluation of the relative severity of different types of defects in increasing stress and contributing toward failure. The procedure will improve knowledge of design and help uncover problems encountered in foundry practice.

Many foundries using design analysis sell customers on design development and charge for the service.

Deoxidation of Steel for Castings by F. W. Boulger, Battelle Memorial Institute, Columbus, O., was the subject at the closing steel session. Factors influencing success of various deoxidizing treatments for steel were reviewed. Oxygen content prior to final deoxidation can be predicted from equilibrium studies of the Fe-C-O system, since it is determined largely by the carbon content at that stage. Best deoxidation results are obtained by combinations of manganese with aluminum and silicon. The manganese doubles the expected deoxidizing power of the individual materials.

Ladle holding time is important. Data shows that after 4-6 minutes, inclusion content is down approximately 90 per cent from what it was at the time deoxidizers were added. Melt compositions also influence the effectiveness of deoxidation.

Pattern—Martin C. Ehrman, International Harvester Co., Milwaukee, spoke on **Epoxy Plastic Pattern Equipment** in the opening pattern session. Milwaukee Works has completed its first year using epoxy plastics with successful results. Savings as high as 75 per cent over new wood patterns have been achieved by making plastic patterns, using old patterns as models. Experience indicates that use of ¼-in. of the plastic over a rough finished metal backing produces the most successful pattern, eliminating many difficulties due to brittleness of plastic.

Cleanliness of the metal backing is important to insure proper bonding of plastic; holes drilled through metal also help anchor the plastic. Advantages cited along with original cost were savings in repair cost, especially coreboxes used for blown cores (often back in production within an hour), and elimination of sand sticking to patterns and coreboxes.

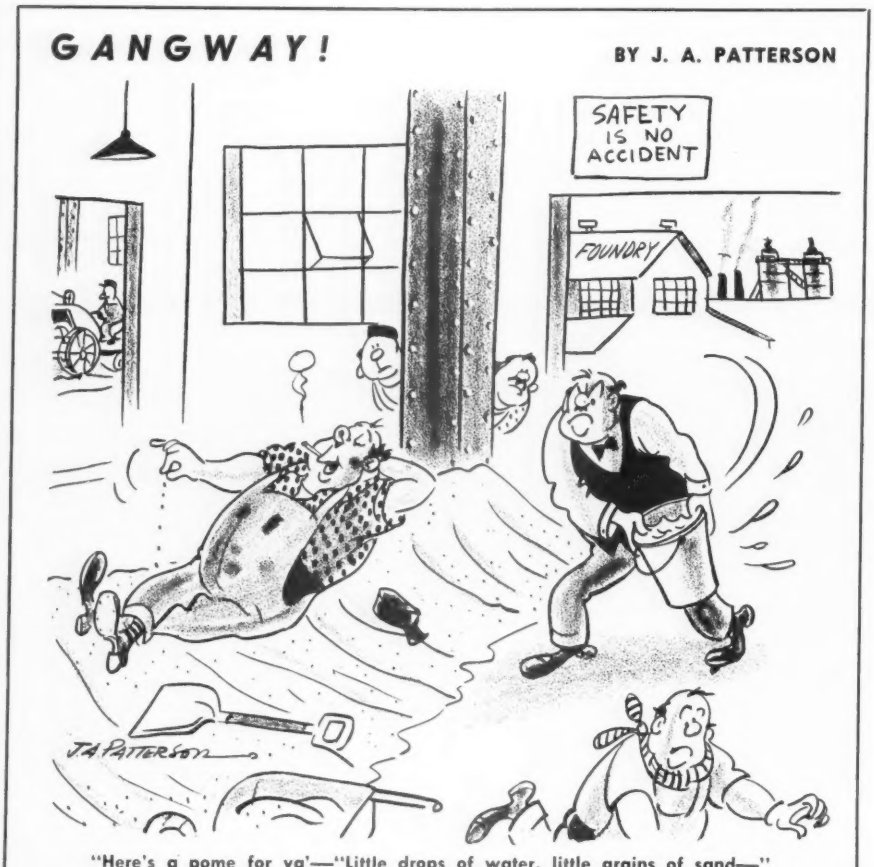
Capable wood patternmakers, experienced in plaster and clay, are required to produce good plastic patterns.

The second session featured a talk by H. Wesley Stokes, Kilbourn Pattern Co., Milwaukee, on **Pattern Design Specifications.** Mr. Stokes discussed patterns for production foundries. Such patterns and coreboxes should be made of hardwood or aluminum reinforced at proper points with steel. Pressure-cast aluminum patterns should be scraped all over and sandcast patterns machined. In both cases, core prints should be machined. Corebox cavities should be machined and hand finished. Patterns should be normalized, and in addition, coreboxes should be heat treated.

Many problems faced by foundrymen can be eliminated by close cooperation between patternmakers and foundrymen. Also workmanship and standards of the entire industry can be raised.

Robert L. Selberg, Caterpillar Tractor Co., Peoria, Ill., addressed the third session on **Production Pattern Equipment as Used at Caterpillar Tractor Co.** That company's pattern equipment is overdesigned intentionally so that cast parts will assure long life of the end product equipment. Design changes are gradual and are thought out years ahead.

Foundrymen and patternmakers can be employed advantageously in design and purchasing departments. The experience makes them valuable



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Proven performance — simplicity — flexibility — power — speed.

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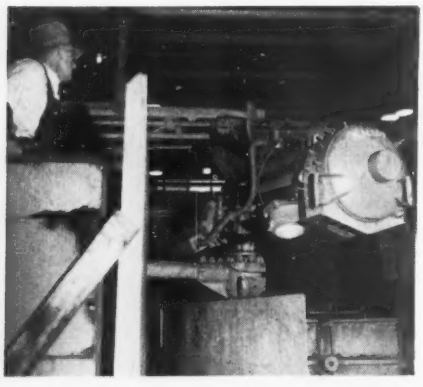
A Progress Report at Fairbanks, Morse-Kansas City

A year and a half of operation at F-M's new Kansas City foundry provides a story of production efficiency

THE new foundry of Fairbanks, Morse & Co. at Kansas City, Kansas, is actually made up of four separate foundries. Gray iron castings are produced in three of these areas while non-ferrous and stainless steel castings are produced in a fourth.

In designing the plant, the requirements of each class of work received full consideration. Thus, the equipment for the production of the very light work is considerably different than that used for the heavier work. However, the entire mulled sand requirement of the plant is handled by Speedmullors.



A close-up of the Hydra Slinger and its operator. Over two-hundred-twenty deep 38 x 42 inch molds are rammed on each shift.

FIVE SPEERMULLORS prepare all of the molding and core sand in the foundry to FM's exact specifications. Two Model "80A" Speedmullors handle all of the molding sand for the light and intermediate molding units. Three smaller Speedmullors are used for the heavy molding unit, the non-ferrous and stainless steel foundry, and the core room.

One of the Model "80As" thoroughly mulls and cools *over three-hundred-fifty tons of molding sand on each eight hour shift.* Up to 395 batches are prepared on each shift and specifications are held exactly from batch to batch. The total mulling cycle for this mullor is only sixty-seven seconds including batch injection, mulling, cooling and discharge. Mulltrolmatic controls handle the cycle timing with precision.

These sand requirements are made necessary by the great ramming capacity of the Super Hydra Slinger supplied with mulled sand from this mullor. This slinger rams over two-hundred-twenty deep 38 x 42 inch molds on each eight-hour shift. This large work is handled on a B & P Roto-Mold turntable of special design. Even with this high production, patterns can be changed on this table in moments . . . that's real flexibility.

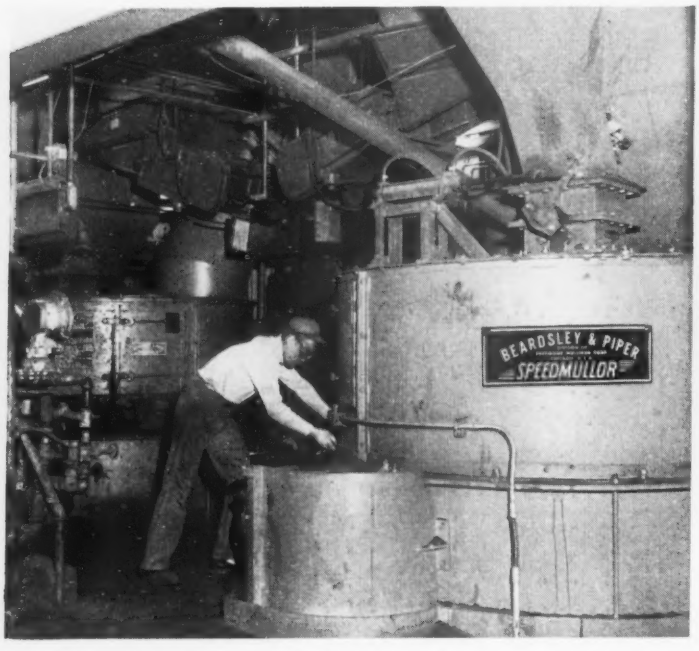
THE HYDRA-SLINGER rammed molds are rolled over and drawn from the patterns on a single B & P 1020 RCX Rol-A-Draw machine.

B & P M-alloy tips and liners are used exclusively on FM's slingers. Here an M alloy liner is reversed.

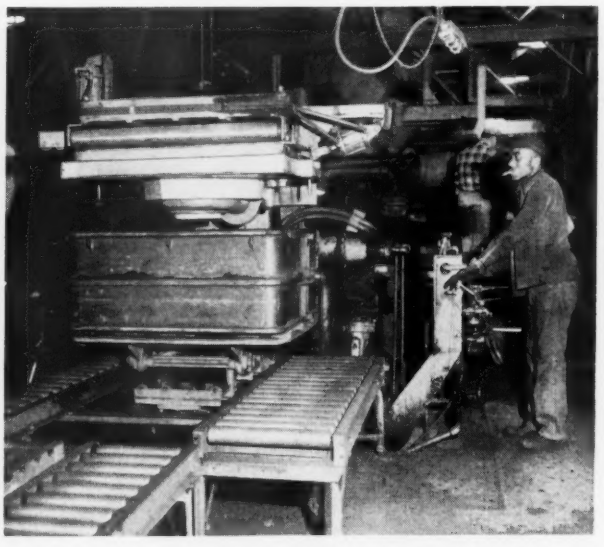
Fast accurate operation is essential, and important Rol-A-Draw features like automatic cycle control and automatic flask equalization make all the difference.

Another slinger on FM's heaviest work is also supplied with Speedmullor mulled sand. On this unit, molds up 60 x 60 inches in size are rammed. Approximately fifty or sixty molds are rammed on each shift.

THE FULL STORY of this outstanding plant was recently featured in Better Methods magazine. A copy of this completely illustrated article will be sent on request. Use the reader service card in this publication.



One of these Model "80A" Speedmullors fully mulls over 350 tons of molding sand to exact specification on each shift.



All of the Hydra Slinger rammed molds made on the Roto-Mold unit are quickly rolled over and precisely drawn on this B & P Rol-A-Draw.

LOOK TO BEARDSLEY & PIPER FOR BETTER METHODS
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THE WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF FOUNDRY MACHINERY

as liaison men between their department and the foundry and pattern shop.

The concluding session heard Harry Weaver, Brillion Iron Works, Inc., Brillion, Wis., discuss **Pattern Equipment for Shell Molds and Shell Cores.** When Brillion started shell molding in late 1951, the company had to build its own dump box machines. Three machines have been built with accommodation for 20 x 32-in. pattern plates.

Present shell mold equipment uses electric pattern heating elements designed to operate at 500° F. Alloy gray iron, which is close grained, is found to be the best pattern material. It must be polished and there must be no back draft. Equipment that has produced 50,000 molds shows little wear. Aluminum is satisfactory as a pattern material also, although it is more open grained. Brass is good, too, since it has high heat conductivity. Chromium plating of patterns has been tried and seems satisfactory, but experience with it is limited.

The use of shell cores has shown many advantages, and they are being produced by standard practice.

In the question and answer period, Mr. Weaver said that insofar as his company is concerned shell molding provides greater latitude than the previous molding method. However, it is just one more casting process and is not a cure-all, he said. Practice involves use of a cold coated sand with 6 per cent dry resin binder.

Nonferrous — Opening session on nonferrous practices featured a discussion on **Effect of Gating Design on Casting Quality** by Hans J. Heine, technical director, AFS. Since 1947 the society has sponsored research in gating of light metals which has resulted in many practical recommendations. Some of those dealing with horizontal gating include keeping crucible lip close to sprue opening, filling the sprue quickly, using a tapered sprue, enlarging the sprue base, placing the runner in the drag and the gates in the cope and avoiding sharp corners and abrupt changes in the flow channel.

In vertical gating a tapered, rectangular sprue is preferred. Runner should have twice the cross sectional area as that at the bottom of the sprue. Gates should have a larger opening into the casting cavity than the attachment to the runner. A side riser prevents turbulent metal from entering the cavity, and a web connection between riser and cavity promotes uniform flow into the latter.

Victor M. Rowell, Harry W. Dietert

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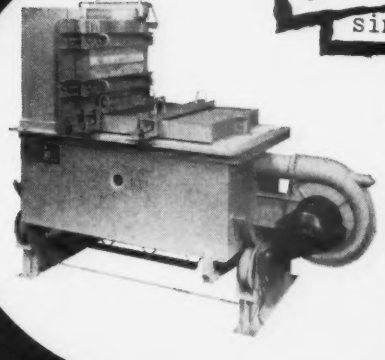
doing a wonderful job . . .

much more flexible . . . entirely satisfactory .

castings come cleaner . . .

sincerely recommend it . .



Reda Stack-Loading melting furnaces for ferrous and nonferrous metals have been designed and built by experienced foundrymen for foundrymen everywhere. That is why Reda furnaces provide advantages far beyond those found in other, and more expensive types; that is why, with Reda furnaces there is less down time for maintenance, longer uninterrupted melting runs, and lower melting costs.

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For Better Melting

Co., Detroit, addressed the second session on **Synthetic Sand Practice.** Molding sand, like a machine tool, is a metal-forming device. It must have the same care. Synthetic molding sands should be formulated with proper screen analysis sand and no more than two or three additives. Water is the most important additive. Other properties are unimportant if moisture content is not what it should be. In fact, it is impossible to change one property without affecting others.

Mr. Rowell described various sand properties and defined flowability as

Session Speaker H. H. Kessler, Sorbo-Mat Process Engineers, left, with J. J. Broecker of Lakeside Malleable Castings Co., a co-chairman of the conference

a sand's ability to ram uniformly against all pattern surfaces. Rammability is the ability of sand to react to ramming to reach its optimum properties. Although laboratory sand tests do not necessarily show the same results as mold tests, they may be correlated. An advantage of laboratory tests is that they can be duplicated and comparisons made.

In general a low moisture sand with good flowability usually will produce the best results.

Users of brass and bronze castings are getting higher quality in these castings than ever before and the demand for such quality is increasing. For such quality to be attained and maintained, the foundry must have a quality control program. These were statements made by F. L. Riddell, H. Kramer & Co., Chicago, in addressing the third session. His subject was **Brass and Bronze Foundry Practice Emphasizing Quality and Quality Control.**

A quality control program must govern casting design, raw materials, foundry practice, equipment and the

human element. Under the raw materials heading, subdivisions to be watched are metal, molding materials, fuel and refractories. The foundry practice heading embraces melting, pouring, gating and risering.

Foundry problems were discussed in an **Information Panel** at the final nonferrous session. Panel members were: Hans Heine, technical director, AFS: F. L. Riddell, H. Kramer & Co., Chicago, and Victor M. Rowell, Harry W. Dietert Co., Detroit. Among the problems discussed were gating, gassing, casting design and sand formulation. It was pointed out that most casting difficulties originate with design. For that reason it is extremely important that designers, customers, foundrymen and patternmakers meet to establish a design which will meet the needs to be imposed on the final product. The advantages of stress coat and strain gage testing in developing proper design were discussed.

Grace Quick, registered nurse from International Harvester Co., demonstrates vision tests

Most foundry problems can be solved if operators will keep accurate and complete quality control charts, drawings and other records. Their intelligent use will help in future design and production of castings.

Gray Iron—At the opening gray iron session, Prof. Philip C. Rosenthal, University of Wisconsin, discussed **Metallography of Cast Iron.** A relationship exists between structures and properties, and gray iron is extremely structure sensitive with properties reflecting the structures. Slides illustrated gray iron structures such as ferrite, pearlite, and others, and showed wedge bar test results on correlation of effect of cooling rate on structure and hardness.

Tensile strength essentially is determined by the size, shape and distribution of graphite and the condition of the matrix which are reflections of chemical composition and cooling rate. Correlation between hardness and tensile strength is limited since adverse distribution of graphite decreases tensile strength, and cementite, the hardness microconstituent, cannot be increased indefinitely due to its brittleness. Machinability largely is determined by the amounts of ferrite, pearlite, steadite and cementite in the matrix.

New Developments in Melting Equipment for gray iron was the topic of H. W. Schwengel, Modern Equipment Co., Port Washington, Wis., at the second session. One example is the closed-top, water-cooled, hot-blast type such as used at Ford Motor Co., Dearborn, Mich. (FOUNDRY, December, 1954). Another is the cupola with the water-cooled shell, hot-blast type and closed top with no refractory above the tuyeres, and a carbon lining below the tuyeres. Such a cupola has been operated two weeks without dropping the bottom, banking the cupola overnight.

At the third session Harry H. Kessler, Sorbo-Mat Process Engineers, St. Louis, discussed **Gates and Risers,** stating that to produce good castings consistently it is necessary

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... with ladle linings made of J-M 3X Blazecrete® — the hydraulic setting refractory

J-M 3X Blazecrete makes possible cleaner castings because it has great ability to resist penetration and attack by molten metal.

3X Blazecrete . . . the 3000F refractory . . . is easily and quickly applied . . . mix with water like ordinary concrete, and slap-trowel to desired thickness. Hardens without application of heat. Contains no harmful irritants . . . safe even for hand application. 3X Blazecrete is furnished as a dry mix, and may be stored indefinitely without deterioration.

Longer lasting linings can be built with 3X Blazecrete because it is spall-resistant, withstands slagging action and has negligible shrinkage.

Send for free brochure on Blazecrete (RC-28A) describing its properties and uses. To obtain your copy—as well as additional application details—write Johns-Manville, Box 60, New York 16, N. Y. In Canada, Port Credit, Ontario.

Whether you gun it... *or slap-trowel it...*

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville BLAZECRETE

BUILDS BETTER REFRACTORY LININGS

to maintain uniformity in sand, cores, coke, metal composition, and melting.

Riser size may be determined by multiplying the casting weight by factors based on the liquid shrinkage and riser efficiency of iron compositions. Factors are 0.02 for class 25 iron; 0.05 for class 30; 0.13 for class 40; 0.20 for class 50; 0.33 for class 60, and 0.38 for nodular iron. The figure obtained is the weight of riser above the mold joint, and to that a suitable addition must be made for the heel or portion below the mold joint. Suggested riser diameter is 1½ times maximum casting thickness, and height twice the diameter. For risers 4 in. or less in diameter, the neck area should be one-half the diameter in square inches while for over 4 in. risers the neck should be equal to the diameter in square inches.

At the final session Earl E. Woodliff, Foundry Sand Service Engineering Co., Detroit, discussed **Almost Every Foundry Can Have Improved Sand.** Sand control begins with the selection of the sand which should not be too coarse or too fine since the one leads to surface roughness and penetration troubles while the other leads toward scabs, buckles, and similar defects. Since those difficulties result from sand characteristics, it is essential that sand mixing and control be placed in the hands of an individual with proper knowledge.

Sand mixing equipment should be maintained in good operating condition, and the bins should be cleaned out regularly to eliminate sticking sand and stratification. Molding machines should be kept in good condition since troubles in mold production often are blamed on sand conditions instead of upon mal-functioning of the machines.

All materials—sand, additives, binders—should be weighed accurately to obtain consistent results. Expansion and other troubles could be minimized by presence of such materials as fireclay, seacoal, pitch and cereal which act as cushions between the sand grains.

ICI Acquires 49th Member

Arwood Precision Casting Co., Brooklyn, New York, has become the 49th member of the Investment Casting Institute, Chicago. The ICI is composed of producers of parts made by the investment casting process. Arwood is a large producer of nonairfoil-type castings. W. I. Matthes, vice president of Arwood, will serve as official company representative to the institute.

How SHELL MOLDING with G-E shell resins CUTS COSTS for CRUCIBLE STEEL COMPANY OF AMERICA

Ask Crucible Steel about shell molding with General Electric shell resins and you'll get a glowing report on *better castings at lower cost!* For Crucible finds the shell process ideal for casting parts in its new Rexalloy*—a super-hard alloy that's too tough to machine easily, too expensive to waste through machining allowances. Shell-molded Rexalloy parts are often usable as cast—far smoother and sharper than conventional sand castings—much less expensive than investment castings. To obtain these benefits, Crucible uses G-E shell resins, relying on them for batch-after-batch uniformity and properly balanced properties.

*Reg. trademark, Crucible Steel Company of America.

How can shell molding help YOU?

General Electric offers a number of products to help foundrymen get maximum benefits from the shell process: *G-E phenolic shell-molding resins* to form light, dimensionally accurate molds . . . *G-E silicone release agents* to free molds easily from patterns . . . *G-E phenolic bonding resin* to cement shell halves together.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Ask G. E. about shell molding!

General Electric maintains a shell-molding laboratory in Pittsfield, Mass., to help users and prospective users of shell molding solve problems and evaluate the process. G.E. also offers a 28-page manual describing the techniques and benefits of this new foundry method. *Just mail the coupon for a free copy!*

FREE SHELL-MOLDING MANUAL!

General Electric Company
Section 6F3A1
Chemical and Metallurgical Division
Pittsfield, Massachusetts

Please send me a free copy of *G-E Shell Molding Manual.*

( ) We are presently using the shell-molding process.
( ) We are interested in the shell-molding process.

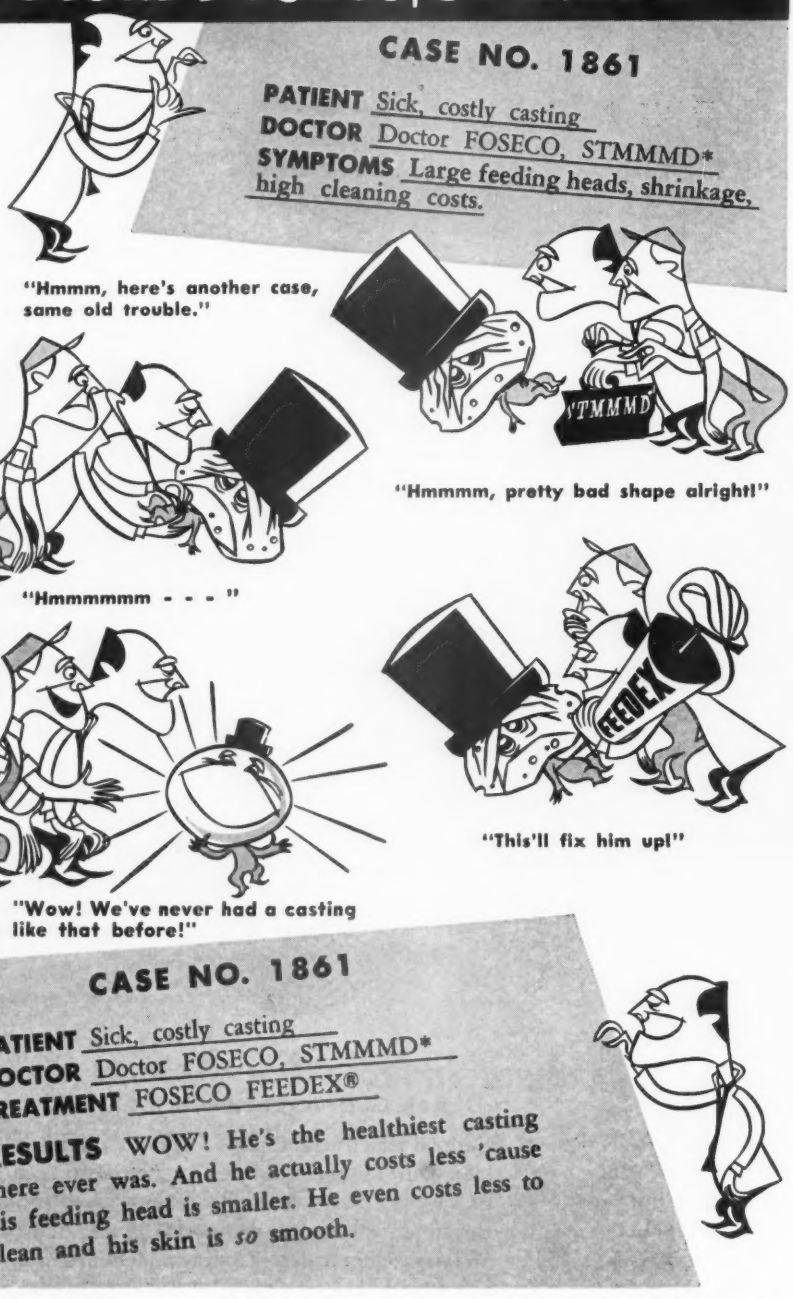
Name _____

Firm _____

Street _____

City _____ Zone ____ State ____

Doctor FOSECO, STMMMD*


CASE NO. 1861
PATIENT Sick, costly casting
DOCTOR Doctor FOSECO, STMMMD*
SYMPTOMS Large feeding heads, shrinkage, high cleaning costs.
"Hmmm, here's another case, same old trouble."
STMMMD
"Hmmmm, pretty bad shape alright!"
"Hmmmmmm - - - "
FEEDEX
"This'll fix him up!"
"Wow! We've never had a casting like that before!"

CASE NO. 1861

PATIENT Sick, costly casting
DOCTOR Doctor FOSECO, STMMMD*
TREATMENT FOSECO FEEDEX®

RESULTS WOW! He's the healthiest casting there ever was. And he actually costs less 'cause his feeding head is smaller. He even costs less to clean and his skin is *so* smooth.

FEEDEX® (fēd 'ĕx) — A moldable exothermic anti-piping compound for increased feeding efficiency. Made of strongly heat-producing materials. Mixed with water and molded into shapes such as sleeves for lining the inside of risers in molds, etc.

Feedex is ignited by the metal entering the riser and sets off an exothermic reaction keeping the head-metal liquid and open for a much longer time to the feeding action exerted by atmospheric pressure. Heat loss is reduced as the insulating properties of the burned out material are greater than those of molding sand.

ADVANTAGES — Feeding efficiency increased, size of risers reduced; with correct use, casting yields are in the region of 80% to 90%.

Reduction of head size means: more castings produced from the same melting capacity; castings on which it is difficult to provide adequate heads due to design can be produced sound and free from shrinkage porosity; reduced cleaning costs.

Feedex is not confined to sleeve application. When molded it can be applied at any position in the mold, helping to obtain directional solidification.

Scientific Treatment of Molten Metals, Molds and Dies

For more information just call or write. You'll get action, fast!

FOUNDRY SERVICES, INC.

2000 BRUCK STREET COLUMBUS 7, OHIO

Feedex is a material especially made and adapted for use in making articles of manufacture covered by U.S. Patent No. 2591105

Malleable Founders Schedule Market Development Conference

Seventh annual Market Development Conference of the Malleable Founders' Society will be held Apr. 12-13 at the Edgewater Beach Hotel, Chicago.

The first day's program, starting at 9:30 a.m., will be devoted to society activities, including reports by the advertising, research and market development committees. The handbook committee will report on progress on revision of the handbook. Lowell D. Ryan, managing director, will report on a special market survey conducted by the society.

Speakers on the first day will include James H. Lansing, technical and research director; L. E. Young, Superior Steel & Malleable Castings Co., and Carl Liebau, Federal Malleable Co., president of MFS. James Hallock, Albion Malleable Iron Co., will serve as conference chairman.

The after-dinner speaker Thursday night will be William Gove, president, EMC Recording Co., St. Paul.

The entire second day will be devoted to a view of the industry by outsiders, as reported by purchasing agents and engineers. In addition, all members attending will discuss examples of conversions they have developed.

Second-day speakers include Roy Webb, purchasing agent, Templeton-Kenly Co., Broadview, Ill. Thomas Seavy, master mechanic, Pontiac Motor Division, General Motors Corp., and representatives of Central Foundry Division GMC, will describe the development of the pearlitic malleable crankshaft now used on all Pontiac cars.

Book Review

FBI Register of British Manufactures—1956, 28th ed., published by Kelly's Directories Ltd. and Iliffe & Sons Ltd. for the Federation of British Industries, cloth, 7½ x 9½ in., 1110 pages. Price 42s.0d.

A comprehensive and accurate guide to a substantial cross section of British industry, this 1956 edition of the FBI Register lists the products and services of more than 7000 member firms under more than 5000 alphabetical headings. French, German and Spanish glossaries give translations of every product term used in the main buyers' guide, and each is numbered for easy reference.

Other sections include a complete alphabetical directory of FBI member firms which lists full names, addresses, range of products or services and, in many instances, such additional information as branch offices, overseas agents, subsidiary companies and other data.

THE NEXT MEDICAL MILESTONE . . . CONQUEST OF CANCER?

In a few short years we've seen the discovery of antibiotics, new wonder drugs for tuberculosis, a vaccine for polio. We will see the conquest of cancer, too, if people want it badly enough. Last year the American Cancer Society was unable to fill requests for research funds totalling almost $3,000,000. The reason—not enough money. Did you give all you could? Will you give all you can?

AMERICAN CANCER SOCIETY®

GENTLEMEN: I want to help conquer Cancer.

☐ Please send me free information about Cancer.

☐ Enclosed is my contribution of $_____ to the Cancer Crusade.

NAME_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

MAIL TO: Cancer, c/o your town's Postmaster

View of 12 x 18-in. shell mold halves, a two-cavity shell core and a finished brass sink trap casting

Molds are poured after shell cores have been set and shells have been pasted together to form finished mold

Shell Molding of Brass Sink Traps

FOUR ounces of brass is being saved in every sink trap casting produced at the Trenton Brass Co., Trenton, N. J., since it converted recently to use of shell molds and shell cores for this job, according to M. W. Schultz, president.

The high-precision shell molds and cores permit the foundry to maintain more uniform thickness throughout the casting, thus reducing its total weight. In addition to this and other savings, the castings are said to be smoother and cleaner in appearance than formerly, with no loss in strength. Cleaning is virtually eliminated. Overall foundry costs reportedly were reduced 30 per cent.

The Shalco shell equipment used to produce molds and cores for these castings includes one manually operated 18 x 24-in. two-station shell molding machine, one 6 x 12 x 18-in. corebox size manually operated shell core blower and two pin-type shell fusers for joining together the shell halves.

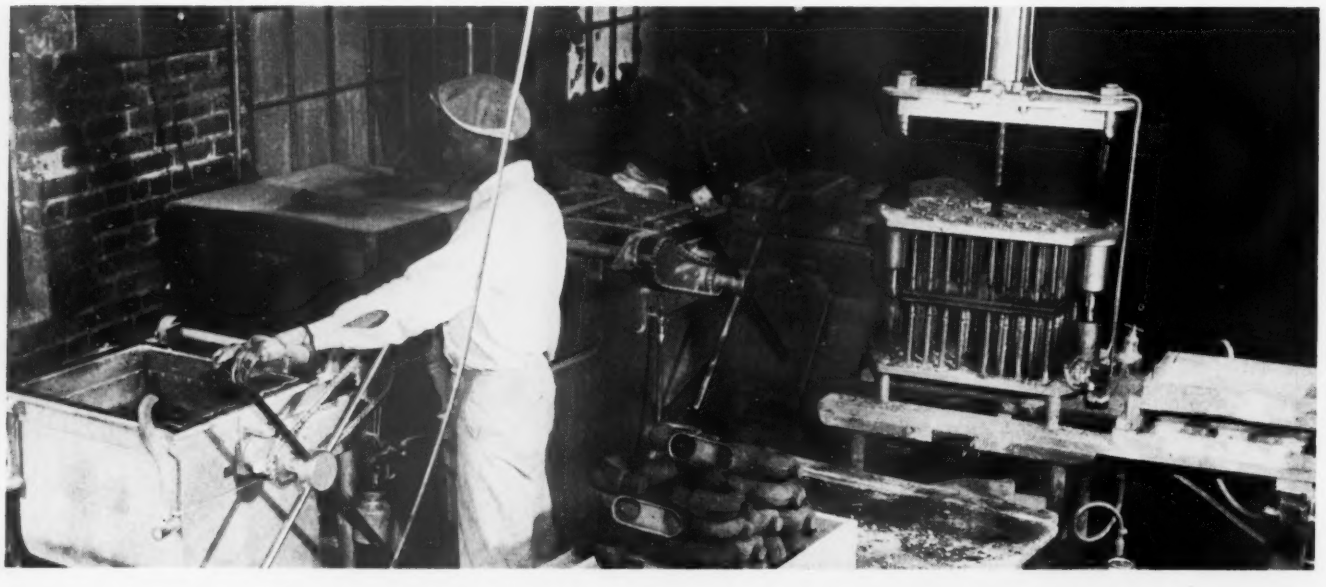
All four pieces of equipment are operated by two men, who also set the cores and arrange the molds on the floor for pouring. All of the equipment is located in one corner of the pouring room floor.

Production schedule maintained by the two operators each eight-hour shift includes a minimum of 900 12 x 18-in. shells and 500 shell cores in a two-cavity metal corebox, in addition to the setting of cores and pasting and joining of the 900 shells into 450 complete shell molds. The molds are poured without backup.

Since this production schedule for the brass sink trap casting is sufficient for the company's daily requirements for this item, it is possible to operate the machines two shifts for two weeks each month, store the finished molds until castings are needed, and use the machines for other jobs during the remainder of the month.

The company states that the 30 per cent overall saving in foundry cost makes no allowance for the reduced space required for the mold and coremaking, nor for the elimination of core driers and baking time.

After investment, the 18 x 24-in. shell mold is cured. Next, it is broken in halves which form finished mold after core is set. Pin-type fuser is at right



HYSTER INDUSTRIAL TRUCKS MOVE MATERIALS *FASTER!*

at Greater PROFIT to You

The MATERIAL HANDLING INSTITUTE'S EXPOSITION
Cleveland, Ohio
PUBLIC AUDITORIUM
JUNE 5th THRU 8th
1956

VISIT BOOTHS 1116 and 1422

LP-Gas equipped YC-40 at Atlas Foundry. Used for smaller workhorse materials handling such as barrels of small castings and pig iron, palletized finished castings and assembled units.

Pictured above is one of many typical examples of how Hyster® Industrial Trucks are helping to effect tremendous savings in the cost of materials handling in Foundries.

Even if you are now using lift trucks or have never used industrial trucks of any kind, your Hyster dealer can show you how you can quickly realize more profit from your operation with these multi-purpose utility tools. Your Hyster dealer knows materials handling . . . he is an expert on the problems and their solution. He can help you with special techniques and cost reducing methods. Call him today...why not take advantage of his materials handling know-how?

HYSTER DEALERS GIVE YOU ALL 3!

1 **PLANNING** — your Hyster Dealer will plan your materials handling operation from scratch, or will analyze your present system to see if it can be improved.

2 **THE RIGHT TRUCK**—for your job from Hyster's complete line of industrial trucks (1,000-30,000 lbs.) and over 100 job-attachments.

3 **THE RIGHT SERVICE**—ample spare parts stock, shop facilities, factory-trained mechanics and an efficient field service that keep your Hyster lift trucks going on your job, wherever your job might be located. Hyster trucks are noted the world over for their low downtime.

Materials Handling Trucks from 1,000 to 30,000 pound capacities

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1010-30 MYERS STREET.....DANVILLE, ILLINOIS
HYSTER N.V. .....NIJMEGEN, THE NETHERLANDS
FOUR FACTORIES: Portland, Oregon; Danville, Illinois; Peoria, Illinois; Nijmegen, The Netherlands.

HYSTER

HYSTER COMPANY

Big Stocks of Glass Materials in 9 NEFF & FRY Bins

Barytes, cullet, feldspar, limestone, salt cake, silica sand, slag, soda ash—these are the materials handled and stored in Neff & Fry Bins at Foster-Forbes Glass Co., Marion, Ind. Four of the nine bins are shown in the photograph.

It would take this entire space to list all of the flowable bulk materials for which our bins are used. In many cases, considerable ingenuity is required to meet the loading and unloading situations. That s when our engineering knowledge plays an important part.

Chances are you'd select our bins for your bulk materials if you knew all the reasons. Ask for our folder, "Bins With the Strength of Pillars."

Not exported except to Canada and Mexico

THE NEFF & FRY CO. • 214 Elm St. • Camden, Ohio

NEFF & FRY ▸ SUPER-CONCRETE STAVE STORAGE BINS

Control Foundry Chilling with CHILL KOOLHEAD NAILS

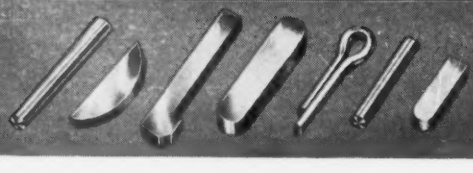
CHILL NAILS and SPIDERS

Choose any style chill nail from jumbo to stubby, slim, medium, or horse nail blade; blunt, pointed, straight or 90° bent. Same types available in Stainless, Brass, Aluminum, Copper coated to order. Spider Chills, jumbo or horse nail legs—double or single. Available in various sizes and types, also made to your individual specifications.

Write for detailed descriptions and prices.

STANDARD HORSE NAIL CORP
Since 1872 NEW BRIGHTON PA.

Other Products
PINS Stanho KEYS
SPECIAL PARTS



State University of Iowa Offers Management Course

College of Engineering, State University of Iowa, will offer its 17th management course, June 11-23, in Iowa City, Iowa. In addition to intensive instruction, the course includes a series of talks by authorities on new developments, applications and problems in management techniques. The program is designed for such persons as factory managers, foremen, industrial engineers, methods and time-study analysts, cost men, office executives and others in related work.

Areas to be covered include production planning, job evaluation, motion and time study, wage incentives, plant layout, material handling, quality control, supervisory training, labor relations and legislation, organization and policy, engineering economic analysis and public speaking. The regular university teaching staff will be augmented by men from a variety of industries and other educational institutions.

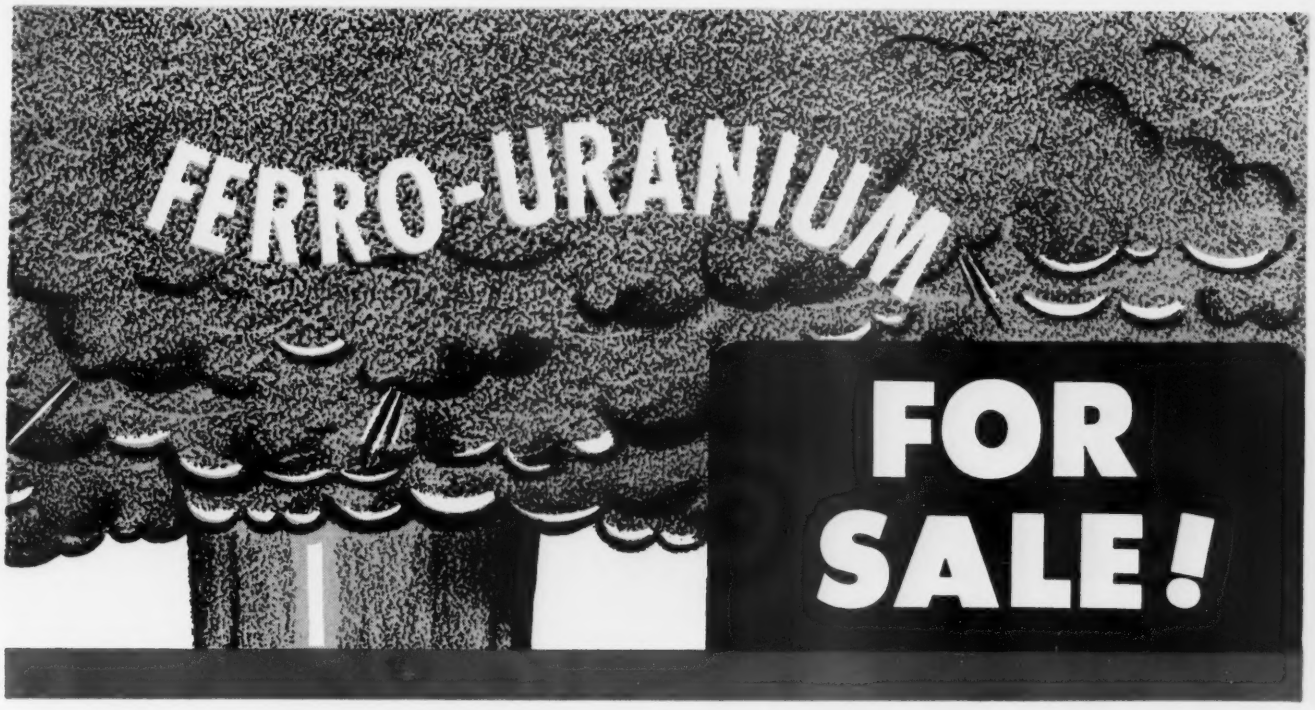
Fee for the course is $200. Luncheon and dinner sessions are $26 and number 12 and 3, respectively. University dormitory facilities will be available for persons who desire such accommodations. Rooms also are available in Iowa City hotels.

Inquiries concerning the course should be sent to J. Wayne Deegan, 122 Engineering Bldg., State University of Iowa, Iowa City, Iowa.

Holds Landscaping Competition

The fourth annual Industrial Landscaping Awards will be presented this year by the American Association of Nurserymen. The awards are designed to help companies improve their community and employee relations. Competition for the 1956 awards ends Sept. 1. A folder describing the contest will be sent upon request to the association, at 10 East 43rd St., New York 17.

"Every time she walks by I feel a strange pulsation running through me."



If you were to see such an advertisement would you think it a fraud? If you considered it possible, would you think it was a development of this atomic day in which we live?

Believe it or not, ferro uranium was produced and uranium steel was produced not this month, or this year, but more than thirty-five years ago.

A treatise published in 1921, giving a full account of this unbelievable ferro-alloy said in part:

> "Uranium is supplied to the steel manufacturer in the form of Ferro-uranium. No difficulties in its employment are found, provided that reasonable precautions are taken in its addition; such precautions are explainable by *the remarkable chemical activity of uranium.*"

Prophetic words those! Little did the experimenters of 1921 realize what a monster they had by the tail. In undramatic language, the writer of this treatise suggested that uranium steel would "increase tool life" and concluded by saying, "Uranium steel marks the greatest single advance in alloy steels in recent years." This evaluation of Uranium steel proved to be far too optimistic. It was difficult to control and never won for itself a place in industry.

So we don't have any ferro-uranium for sale, but we are proud of an industry that has enough imagination to run thirty years out beyond the frontiers of scientific knowledge.

We're proud to be a part of the alloy steel industry for whom we have produced quality ferro-alloys for almost a third of a century.

OHIO FERRO PRODUCTS

- FERRO-SILICON 25 - 50 - 65 - 75 - 85 - 90%
- SPECIAL BLOCKING 50% FERRO-SILICON
- SILICON METAL
- LOW CARBON FERROCHROME
- HIGH CARBON FERRO-CHROME
- LOW CARBON FERRO-CHROME SILICON
- STD. FERRO-MANGANESE
- SILICO-MANGANESE
- MED. CARBON FERRO-MANGANESE
- BOROSIL
- SIMANAL
- RARE EARTH ALLOYS

Briquets

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- MANGANESE
- SILICO-MANGANESE
- CHROME

DEPENDABILITY • QUALITY • SERVICE

PHILO · TACOMA · BRILLIANT

Ohio Ferro-Alloys Corporation

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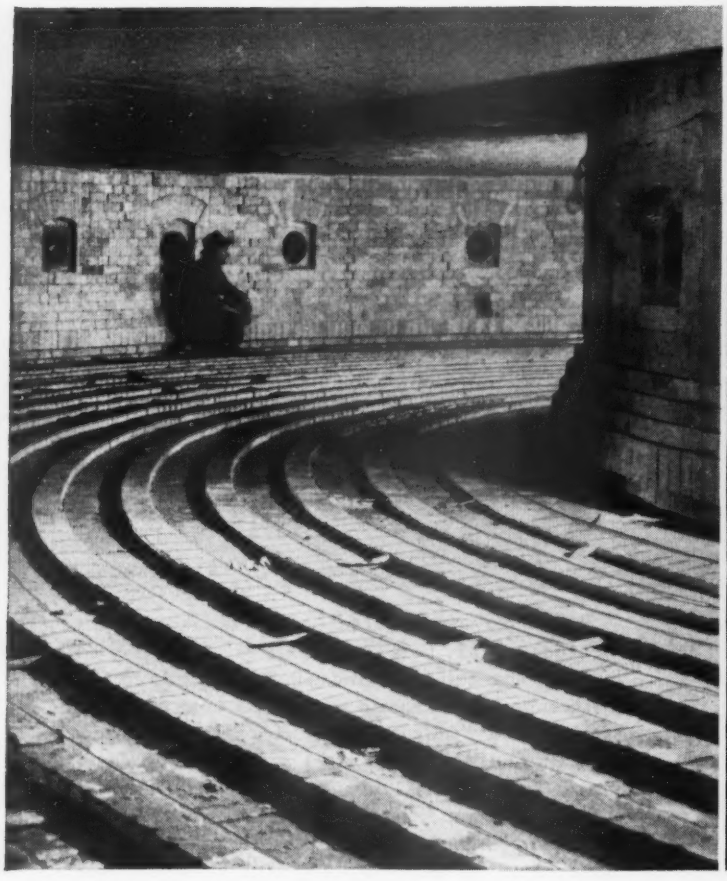
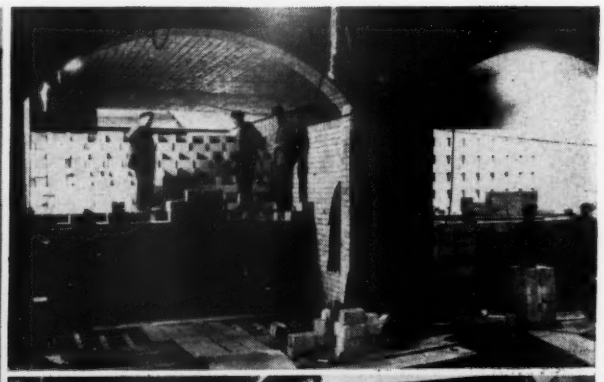
Chicago Detroit Pittsburgh Tacoma Seattle Denver
Minneapolis Birmingham San Francisco Los Angeles

Profitable trends in the use of refractories





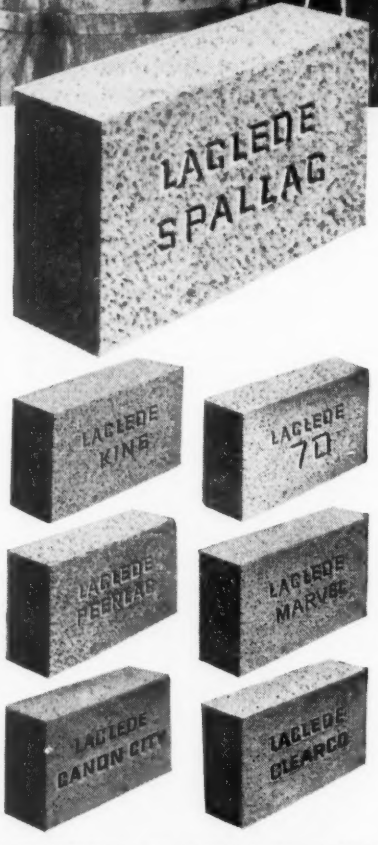
Laclede-Christy offers simplified way to get exact-purpose fire brick

It's highly profitable, of course, to use refractories exactly suited to each application. There's a simple way to do this. That is to rely upon one source which offers you each refractory type and grade you may need—plus the quality and service you expect.

Laclede-Christy produces 68 different varieties of fire brick and other refractories—to meet a wide temperature range. From this outstanding selection you are certain to obtain the types and grades that serve your needs best.

Laclede offers you refractories custom-typed for your use—not just a product line. Laclede brands such as Spallac, King, Laclede 70, Peerlac, Wallac, Canon City, Marvel and Clearco justify their excellent reputation and acceptance. Laclede checker brick, cupola blocks, tile and many other items also meet Laclede's and your "quality-first" standards.

If you need help to determine your exact-purpose fire brick, Laclede-Christy offers that too. So, for a profitable trend in *your* use of refractories, get together with Laclede soon. Your representative is nearby.



LACLEDE-CHRISTY COMPANY DIVISION

LACLEDE CHRISTY COMPANY FOUNDED 1844 Quality First

HKP A DIVISION OF H. K. PORTER COMPANY, INC.

H. K. PORTER COMPANY, INC.
2000 Hampton Ave. • St. Louis 10, Missouri

Foundry Statistics

MALLEABLE IRON

(Shipments of castings—net tons[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1953	970,506	578,749	.....
1954			
Dec.	80,599	49,005	85,064
Total	812,016	461,982	.....
1955			
Jan.	82,028	48,000	99,817
Feb.	85,979	48,721	101,766
Mar.	102,364	60,063	99,730
Apr.	101,226	57,397	104,091
May	98,397	57,317	106,446
June	99,456	60,261	107,559
July	75,570	44,914	115,420
Aug.	82,448	48,126	123,473
Sept.	87,215	55,471	116,636
Oct.	90,866	53,804	121,261
Nov.	99,280	58,069	116,981
Dec.	99,946	60,409	123,107
Total	1,104,775	652,552	.....

COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1953	990,496	888,369	61,316	.....
1954				
Dec.	72,421	65,159	4,346	32,054
Total	835,930	753,179	48,848	.....
1955				
Jan.	72,233	64,540	4,678	30,864
Feb.	75,253	67,768	4,598	37,520
Mar.	92,149	83,149	5,649	42,940
Apr.	84,183	75,903	5,152	51,111
May	85,008	76,064	5,513	49,198
June	90,478	80,869	5,840	45,820
July	65,816	59,138	3,998	48,085
Aug.	87,206	77,721	5,322	51,251
Sept.	89,600	80,481	5,603	57,313
Oct.	91,192	82,958	4,513	56,751
Nov.	90,345	80,934	5,807	57,049
Dec.	88,287	78,327	6,368	57,146
Total	1,011,748	907,852	82,201	.....

ALUMINUM

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1953	658,022	214,553	200,025	239,330	.....
1954					
Dec.	64,045	13,753	23,629	26,017	99,556
Total	624,973	158,473	214,408	245,291	.....
1955					
Jan.	64,414	13,358	23,679	26,819	102,382
Feb.	66,869	13,579	24,319	28,234	108,939
Mar.	78,958	16,019	29,029	33,229	110,046
Apr.	73,049	14,041	28,028	30,208	109,156
May	71,691	14,235	25,597	31,243	104,984
June	68,473	14,920	24,682	27,939	102,799
July	55,033	11,716	21,006	21,656	101,024
Aug.	64,864	14,916	22,267	27,004	105,994
Sept.	67,069	14,769	23,075	28,532	111,696
Oct.	72,197	14,485	25,135	31,741	120,222
Nov.	75,065	14,327	26,267	33,852	126,954
Dec.	75,275	15,291	25,031	34,347	123,363
Total	832,957	171,656	298,115	354,804	.....

MAGNESIUM

(Shipments of castings—1000 pounds[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1953	34,517	31,469	.....
1954			
Dec.	2,287	1,906	6,678
Total	25,777	22,950	.....
1955			
Jan.	2,305	2,067	7,236
Feb.	2,160	2,009	7,376
Mar.	2,572	2,311	7,011
Apr.	2,633	2,405	6,800
May	2,399	2,174	6,530
June	2,367	2,098	6,346
July	1,920	1,763	5,912
Aug.	2,176	2,002	5,964
Sept.	2,478	2,260	5,670
Oct.	2,302	2,077	5,394
Nov.	2,325	2,148	5,805
Dec.	2,255	2,018	5,981
Total	27,892	25,332	.....

PRODUCTION WORKERS

Estimated Number
(Thousands)

	Dec. 1955	Nov. 1955	Dec. 1954
Ferrous	229,300	225,100	190,200
Nonferrous	76,500	75,700	64,700

Average Weekly Earnings

Gray Iron	86.09	87.96	77.36
Malleable Iron	87.14	85.90	79.17
Steel	95.70	93.52	78.38
Nonferrous	89.66	88.60	84.36

Average Weekly Hours

Gray Iron	42.2	42.7	40.5
Malleable Iron	42.3	41.9	40.6
Steel	43.5	42.9	38.8
Nonferrous	41.7	41.4	40.8

Labor Turnover Rate (Dec.)
(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	3.5	2.5	1.6	0.2
Malleable Iron	2.5	2.7	1.7	0.4
Steel	3.2	3.0	1.3	0.9
Nonferrous	3.0	3.6	1.3	1.2

Source: Bureau of Labor Statistics

GRAY IRON CASTINGS—SHIPMENTS (Net Tons[1])

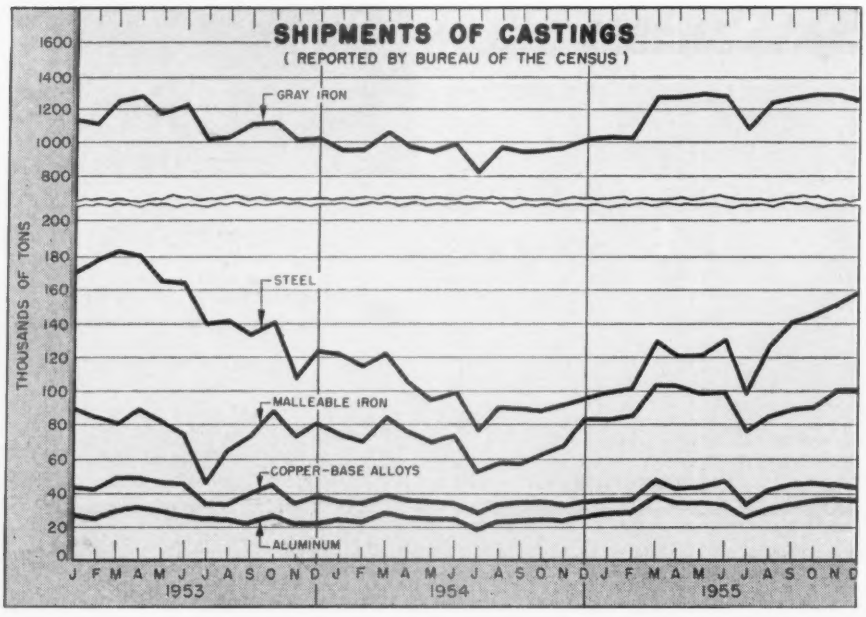
	All Castings		Miscellaneous Castings		Heavy Steel Ingot Molds		Chilled Railroad Car Wheels	Pressure Pipe & Fittings	Soil Pipe & Fittings	Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	For Sale	Total	Total[3]	Total[3]	
1953	13,707,902	7,494,843	8,449,837	3,675,454	2,829,159	1,389,483	467,142	1,285,598	677,166	.....
1954										
Dec.	1,074,258	563,699	680,700	276,045	200,004	97,936	27,229	111,082	55,203	744,633
Total	11,532,158	6,322,989	7,292,292	3,064,886	1,784,625	843,899	325,859	1,376,671	743,711	.....
1955										
Jan.	1,091,923	563,153	712,097	282,386	192,132	97,007	25,783	100,638	61,273	782,656
Feb.	1,106,165	578,171	720,304	291,675	196,118	99,794	27,401	95,285	67,067	852,168
Mar.	1,314,918	688,733	847,874	334,287	217,571	109,681	36,732	129,746	82,995	934,224
Apr.	1,293,678	679,867	819,872	319,149	216,116	108,490	35,415	145,871	76,404	966,057
May	1,310,424	707,105	803,897	315,072	227,236	117,915	35,966	168,772	74,553	937,949
June	1,298,196	715,862	793,067	327,520	228,044	117,727	43,807	147,351	83,927	981,918
July	1,069,711	579,122	634,869	246,297	210,130	112,137	28,181	129,191	67,340	1,049,565
Aug.	1,226,312	688,317	718,423	301,502	238,007	121,071	29,298	156,074	84,510	1,160,466
Sept.	1,252,736	712,688	731,073	314,223	244,199	124,811	29,953	165,332	82,179	1,150,933
Oct.	1,310,309	713,671	795,875	327,827	245,749	122,722	31,877	160,875	75,923	1,113,336
Nov.	1,305,633	696,523	797,854	327,580	262,506	127,739	29,795	148,560	66,918	1,061,546
Dec.	1,259,740	663,993	786,480	328,445	262,056	133,115	30,833	133,935	46,436	1,075,477
Total	14,837,745	7,987,205	9,161,685	3,715,963	2,739,864	1,392,209	385,041	1,681,630	869,558	.....

STEEL CASTINGS—SHIPMENTS (Net Tons[1])

	All Castings			Carbon			Alloy			Unfilled Orders[2]
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	
1953	1,834,197	1,400,013	321,010	1,276,729	959,493	293,491	557,468	417,148	27,519	.....
1954										
Dec.	93,547	69,843	12,489	62,967	45,632	10,469	30,841	24,211	1,245	179,148
Total	1,184,096	880,158	135,581	802,321	580,474	120,309	381,285	303,428	15,315	.....
1955										
Jan.	98,238	75,044	13,809	67,307	49,816	12,762	30,841	25,228	1,047	201,839
Feb.	106,430	80,729	16,501	74,709	55,014	15,381	38,945	25,715	1,120	202,301
Mar.	127,460	98,926	19,339	88,867	68,013	17,887	34,933	30,913	1,452	215,059
Apr.	120,053	92,237	16,646	84,247	63,244	15,163	35,806	28,993	1,483	221,336
May	122,465	92,713	16,810	85,950	63,182	15,335	36,515	29,531	1,475	225,302
June	133,887	102,457	19,591	93,417	69,986	17,979	40,470	32,471	1,612	251,416
July	97,875	71,170	11,631	68,094	48,140	10,666	29,781	23,030	965	354,628
Aug.	126,406	96,290	20,576	91,245	68,514	19,094	35,161	27,776	1,482	413,531
Sept.	140,843	107,622	23,594	100,775	76,156	21,991	40,068	31,466	1,603	420,616
Oct.	145,674	110,409	23,745	105,345	79,235	22,375	40,329	31,831	1,370	418,063
Nov.	152,381	116,908	25,635	111,517	84,064	24,050	40,810	33,518	1,585	453,113
Dec.	158,982	122,201	29,003	116,872	88,894	26,919	42,110	33,980	2,084	475,335
Total	1,530,694	1,166,706	236,880	1,088,345	814,258	219,602	445,769	354,452	17,278	.....

[1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.

FOUNDRY STATISTICS



COMMERCIAL HEAT TREATING

(National Billings of Metal Institute Members)

	1953		1954		1955	
	No. Reporting	Total Reported	No. Reporting	Total Reported	No. Reporting	Total Reported
Aug.	60	2,452,186	62	1,801,659	64	2,439,300
Sept.	57	2,522,127	63	1,853,665	63	2,581,000
Oct.	59	2,782,219	63	1,891,100	63	2,785,100
Nov.	59	2,493,497	63	1,932,700	63	2,809,100
Dec.	57	2,219,406	63	2,057,500	63	2,786,600
Annual total		31,733,067		24,590,500		29,601,200

ZINC-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1953	521,253	349,022	.....
1954			
Dec.	54,410	35,211	69,603
Total	520,501	322,845	.....
1955			
Jan.	58,586	35,472	70,691
Feb.	58,585	35,893	73,858
Mar.	71,811	44,048	81,363
Apr.	71,595	45,477	81,756
May	63,735	38,124	74,472
June	66,569	42,753	71,344
July	47,928	27,429	68,927
Aug.	62,677	61,957	75,592
Sept.	62,030	43,498	80,660
Oct.	71,689	46,581	85,489
Nov.	75,099	47,572	93,001
Dec.	70,950	47,547	86,120
Total	781,254	516,351	.....

INDEX OF FOUNDRY EQUIP. ORDERS

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1954	1955
Jan.	173.8	81.0
Feb.	99.9	90.4
Mar.	82.7	163.6
Apr.	125.3	178.6
May	80.8	145.7
June	86.4	186.8
July	68.8	213.4
Aug.	75.6	134.0
Sept.	68.3	156.7
Oct.	147.5	108.6
Nov.	61.4	154.4
Dec.	113.9	183.9

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent (monthly average). This is a new base period. Source: Foundry Equipment Manufacturers Association.

COKE PRODUCTION AND CONSUMPTION

(Net tons)

	Production	Consumption—Total	Consumption—By Foundries
1953	78,467,806	78,227,414	2,915,420
1954			
Dec.	5,610,564	5,615,228	217,104
Total	59,526,723	59,139,159	2,479,926
1955			
Jan.	5,805,926	5,862,113	234,784
Feb.	5,394,166	5,519,241	242,282
Mar.	6,235,909	6,306,723	286,072
Apr.	6,135,645	6,164,459	278,242
May	6,426,747	6,570,567	277,967
June	6,148,026	6,297,338	249,525
July	6,169,770	6,266,631	221,372
Aug.	6,395,422	6,439,101	249,425
Sept.	6,397,133	6,501,013	260,608
Oct.	6,630,609	6,813,118	283,818
Nov.	6,545,862	6,577,008	285,021
Dec.	6,865,032	6,949,073	284,936
Total	75,150,247	76,266,385	3,154,052

INGOT BRASS AND BRONZE

(Shipments in net tons)

	1956	1955
Jan.	27,736	25,201
Feb.	.....	25,349
Mar.	.....	29,713
Apr.	.....	27,641
May	.....	23,708
June	.....	23,141
July	.....	18,513
Aug.	.....	27,013
Sept.	.....	26,349
Oct.	.....	25,228
Nov.	.....	25,102
Dec.	.....	21,448
Total for year	27,736	298,406

IRON AND STEEL SCRAP CONSUMPTION

(Gross tons*)

	All Scrap Total	By Types of Furnace—Cupola Total	By Types of Furnace—Air Total	By Types of Furnace—Electric Total
1953	69,005,976	9,676,463	1,026,334	8,263,880
1954				
Oct.	4,782,488	710,127	67,678	528,432
10 mo.	44,776,345	7,006,860	690,453	4,960,923
Nov.	4,928,850	737,286	71,844	573,298
Dec.	5,075,563	798,435	82,910	566,223
Total	54,780,758	8,542,581	855,207	6,100,444
1955				
Jan.	5,416,052	813,682	90,622	614,824
Feb.	5,350,452	823,465	91,916	577,296
Mar.	6,313,717	993,266	113,198	727,401
Apr.	6,239,036	975,751	108,965	726,138
May	6,415,947	963,082	109,074	745,060
June	6,117,573	928,908	116,419	733,578
July	5,447,130	730,735	81,216	623,623
Aug.	5,913,031	868,644	101,607	765,343
Sept.	6,060,491	881,158	119,550	753,318
Oct.	6,443,349	944,685	113,411	820,642
10 mo.	59,716,778	8,923,376	1,045,978	7,087,218

PIG IRON PRODUCTION AND CONSUMPTION

	Production**—Total	Production**—Foundry	Production**—Malleable	Production**—Basic	Production**—Low Phos. Intermediate Low Phos. & Bessemer	Consumption*—Total	Consumption*—Cupola	Consumption*—Air	Consumption*—Electric
	(standard grades—net tons)					(By type of furnace—gross tons)			
1954	58,113,924	2,241,436	2,798,646	47,485,047	5,587,465	52,373,541	4,364,418	215,158	155,258
1955									
Jan.	5,729,404	243,608	272,451	4,703,875	509,470	5,202,360	409,281	18,874	20,016
Feb.	5,394,585	209,852	252,860	4,425,080	506,793	4,964,515	409,141	20,576	22,551
Mar.	6,406,902	221,437	359,413	5,239,116	586,936	5,830,943	480,639	24,066	15,931
Apr.	6,329,927	210,085	305,188	5,068,506	746,148	5,725,258	467,709	21,536	12,857
May	6,753,236	246,661	342,544	5,385,299	788,732	6,044,882	471,657	21,448	20,085
June	6,494,838	238,412	347,631	5,245,861	662,934	5,774,896	454,751	22,871	21,697
July	6,329,393	233,235	344,365	5,116,960	634,833	5,430,550	361,171	16,483	19,535
Aug.	6,529,580	251,459	319,951	5,214,901	743,269	5,769,689	442,532	22,014	25,685
Sept.	6,653,578	252,630	343,919	5,397,134	659,895	5,903,190	445,099	23,340	24,552
Oct.	6,905,280	267,405	315,045	5,647,527	675,303	6,193,512	470,610	22,659	23,328
Nov.	6,636,649	241,727	353,713	5,404,584	636,625	.....	.....	.....	.....
Dec.	6,887,667	242,446	329,607	5,660,307	655,307	.....	.....	.....	.....
Total	77,114,073	2,858,957	3,884,971	62,570,394	7,799,751	.....	.....	.....	.....
1956									
Jan.	6,985,945	210,755	283,831	5,803,235	688,124	.....	.....	.....	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only.

New RESINOX* Cold Coating Resins–

free-flowing, non-dusting, easy-mixing!

Monsanto's improved phenolic resins for shell molds and cores eliminate caking problems of stored coating sands!

Field-test reports are coming in. Foundry men state that use of Resinox Cold Coating Resins is stepping up the efficiency of their shell molding operations.

The improved Resinox formulations, developed in Monsanto's Foundry Research Laboratory, are demonstrating outstanding free-flowing and non-dusting characteristics. Mixing time is reduced for either dump box or blowing equipment. No caking problems are encountered under normal storage conditions.

With Resinox Cold Coating Resins you can simplify your coating cycle. Conventional mixing equipment as well as specially designed mixers can be used. The resultant resin coating on each sand particle enables smaller amounts of resin to achieve the required strength properties in shell molds and cores.

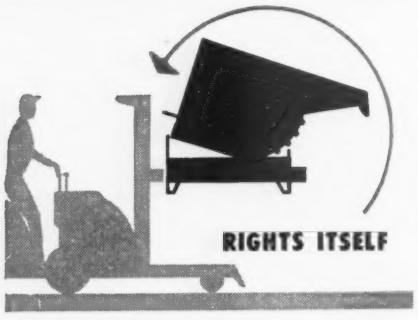
Castings produced with these shells require little or no machining. Edges are clean and sharp. Intricate detail is maintained.

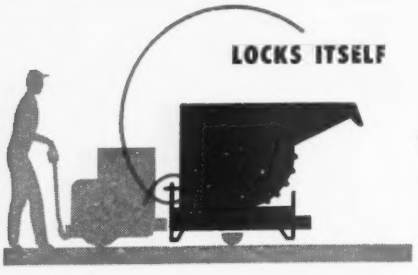
Because the economy and efficiency of shell molding depends so much on the quality of the resin used, it will pay you to get specific information on this new development. Send for data sheets and literature on new Resinox Cold Coating Resins. Write Monsanto Chemical Company, Plastics Division, Room 449, Springfield 2, Mass.

See the Monsanto Exhibit
AFS Convention, Atlantic City
May 3-9
Booths 1825 and 1827

*Resinox: Reg. U. S. Pat. Off.

MONSANTO





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Meditations of a Sandman

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"Australian Memories"

I MUST look back nearly 40 years to my most interesting experience in foundry practice. It occurred in Australia. I had just completed my apprenticeship as an iron molder in California and decided to act upon the advice of my older shopmates, who insisted, "You've got to travel, son, if you expect to get experience!" I traveled—and in Australia, the experience came fast!

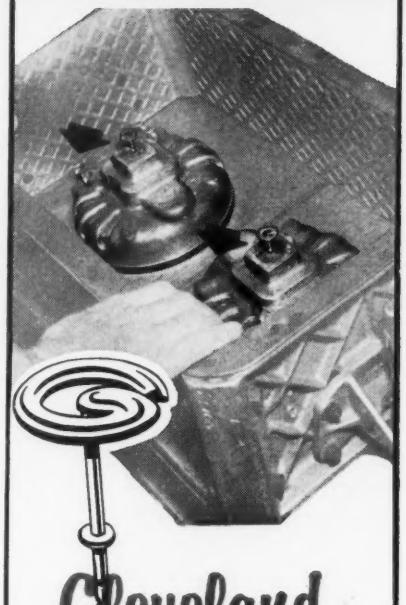
A gray and cheerless fog hung over San Francisco bay that afternoon of Jan. 9, 1917, as I boarded the good ship Ventura and said "goodbye" to everything that meant anything to me. From then on, my life became something out of the pages of a storybook. Existence aboard ship was a strange and exhilarating experience, more dreamlike than real. A week brought me, on Jan. 15, to Honolulu, where I paid the inevitable visit to Waikiki and to the aquarium and marveled in open-mouthed wonder at that incredible paradise of the Pacific.

After seven more days of ship life, we entered the harbor of Pago Pago, where crowds of colorful natives seemingly had declared a holiday to extend a royal welcome to us. There, Stevenson's *Treasure Island* ceases to be description on a printed page and becomes instead a living, chattering, jungle of palm trees where one almost expects to see Long John Silver hobbling along the shore.

We had eight hours of this island leg-stretching, then again weighed anchor, for our final week aboard ship. At last, on Jan. 30, we entered Sydney Harbor, and our twenty-one days afloat became a closed chapter. The security and friendships which seemed real and enduring during the voyage dissolved and disappeared the moment we stepped on land.

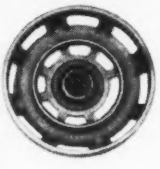
In 1917, Sydney's two finest hotels were the Sydney and the Australia. I decided that these were too pretentious for a neophyte molder who had a slight financial problem, and

TAYLOR & BOGGIS
USES 18% LESS SAND SAVES LABOR WITH...



Cleveland FLAT COIL CHAPLETS

Note clean chaplet breakoff on end bell hub which reduces cleaning operations.



Due to their low cost, Taylor & Boggis also uses flat coil chaplets for soldiers in deep green sand core pockets.

Only 1/2" to 1" of sand cover is required in the cope for firm support of these end bell core chaplets. Flasks are lighter and 18% less sand is handled on the end bell mold line.

In addition to providing positive core support, Cleveland Flat Coil Chaplets speed molding at Taylor & Boggis due to uniform stems and plating thickness. Check today for details on flat coil chaplet advantages in your molding lines.

Write today for *sample* and catalog!

Cleveland *Since 1890*
CHAPLET & MFG. CO.
26471 LAKELAND CLEVELAND 32, OHIO

I registered at The Salvation Army People's Palace, which boasted of being the largest hotel in the Southern Hemisphere and probably was patronized by the less discriminating portion of the traveling public.

After a breakfast of porridge and tea, I started my first Australian day by knocking at the door of the Australian Molder's (metals) Union of Australasia, where I was greeted by its genial secretary, Billy Bathgate, who provided me with the credentials necessary to my future progress.

My first job was at the J. T. Jay iron and brass foundry, on Erskine street, in the Darling Harbor area. It was a very small shop which employed some eight or ten men who worked in very cramped quarters. Over the iron molding floor, the roof was hinged, and it raised by a pulley-rope to admit sunlight. During rain storms, this roof was lowered, and the molders covered their pouring ponds with tomato cans to protect this vital surface from the inevitable drips.

Cupola Stood Outside

The cupola at this shop stood just outside the building, unprotected by anything resembling a roof, and it was not uncommon for molders to catch iron at the spout, with bull or hand ladles, apparently oblivious to the falling rain.

I presume that in 1917 there were many shops in the U.S.A. and elsewhere in the world at which methods were as crude as those witnessed by me in Australia, but it was my first contact with such conditions, and the impression proved indelible.

At Metters Ltd., the largest shop of my experience in Sydney, over 100 molders were employed under one roof, principally in the production of bathtubs, sinks and soil pipe. There, my day's work consisted of nine 24-in. sinks. All sand was processed by screen and shovel, and molds were entirely hand-rammed. During my stay there, the superintendent was a Mr. Blucher, an American from Detroit.

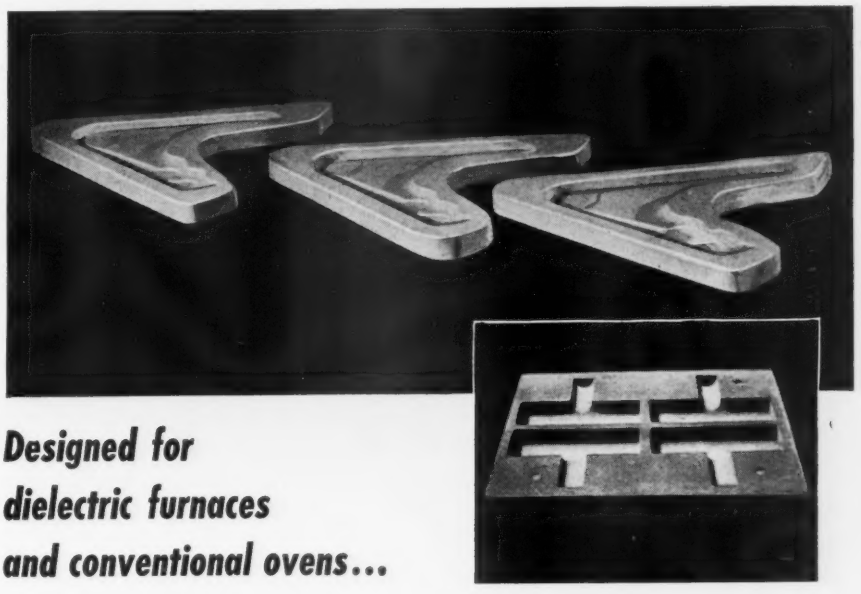
At Marrickville Malleable, I witnessed the highest production per man of my trip. This company operated two foundries a few blocks apart. In the smaller of the two, four bench molders made toe and heel plates for soldier's boots. Each molder made and poured 200 molds per eight-hour shift, and each mold contained four heel and four toe plates. Each morning, all castings from the preceding heat were micrometered by a government inspector, who seemed to me to be overzealous in his rejections.

This plant was operated by a Mr. Squires and his son Eric. According to Andrew Ondreyco, past AFS director, the shop was fairly well mechanized as early as 1938.

My only experience at molding bathtubs occurred at the Foreman & Son foundry, also in Marrickville. Two molders there made three tubs per day. Each made a mold in the morning, and in the afternoon they worked together on the third tub. They worked under conditions and with equipment that would defy description. These men were truly mechanics—they had to be!

My last job in Sydney was as a bench molder at Thompson & Son's, where Andrew Thompson was manager. There, an attempt was made at mechanization. Two American squeezers were devoted to the production of small T-shaped electrical conduit fittings, with metal thickness of about 1/16-in.

Cores were made of gangway sweepings with a small amount of white flour added. Although baked,



Designed for dielectric furnaces and conventional ovens...

J-M Pallite Plates and Form Driers afford desirable operational advantages

Service records prove that Johns-Manville Pallite outperforms and outlasts many other materials in use in dielectric type furnaces. The advantages of Pallite are due to its special formulation, developed by Johns-Manville for use in dielectric furnace core-drying operations in foundries. Pallite offers the following desirable characteristics:

- **light weight**
- **uniform electrical conductivity**
- **uniform thermal conductivity**
- **dimensional stability**
- **nonsweating**
- **moisture-absorbent**

Pallite Plates are now available in both flat and grooved form. Pallite Form Driers are also available, contoured to support irregular shaped cores properly during their travel through the furnace. For details about J-M Pallite materials, write Johns-Manville, Box 60, New York 16, N. Y. In Canada, Port Credit (Toronto), Ontario.

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Johns-Manville PALLITE

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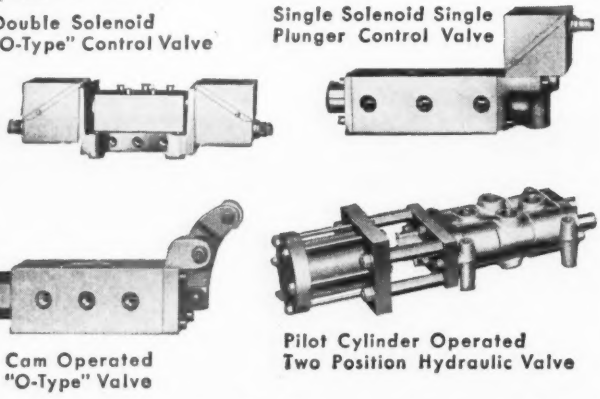
Quick-As-Wink®

AIR AND HYDRAULIC

CONTROL VALVES

DESIGNED AND BUILT TO ASSURE



Double Solenoid "O-Type" Control Valve

Single Solenoid Single Plunger Control Valve

Cam Operated "O-Type" Valve

Pilot Cylinder Operated Two Position Hydraulic Valve

efficient and dependable operation of your machines and machinery

Can you afford to gamble with less?

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Positive and fast acting Quick-As-Wink valves meet the most exacting requirements. They deliver dependable precision performance month after month and year after year. Machine operators, foremen, superintendents *and machine builder trouble shooters* will tell you that there is nothing better than a Quick-As-Wink valve. REMEMBER,— your efforts to increase production and cut costs can only be as successful as the air and hydraulic valves that control the operations. Don't gamble. Play safe. Specify Quick-As-Wink valves. Get full details. Write for Bulletin No. 531, *Today!*

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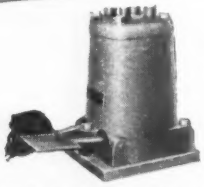
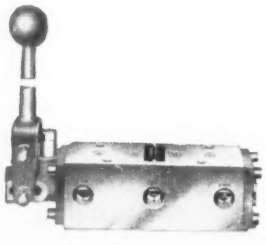


FOOT OPERATED SLIDING SLEEVE VALVE ⅜" to 1" sizes. Single pedal spring return and two pedal designs. Operator has both hands free to handle the work.



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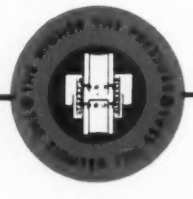

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Mfd. by C. B. HUNT & SON, INC., 1979 East Pershing St., Salem, Ohio

they were extremely brittle and hard to handle. Casting loss, due mainly to core breakage, ran as high as 50 per cent. It was there that I had the satisfaction of introducing oil-sand, which proved to be a lifesaver on it as well as on other jobs.

There may be those who will feel that I am writing slightingly of Australian foundry practice, but I would assure you that nothing is farther from my intention. The Australian foundryman was doing the best he could with the materials at hand. And remember, the year was 1917. I have no doubt that since then Australia has kept pace with industrial progress elsewhere.

Since I was in search of experience, I didn't remain long in any one shop. I considered three months a long stretch, and if I wasn't laid off or sacked, I managed to find some plausible excuse for quitting. Because I was single and completely footloose, I occasionally gave vent to my adventurous spirit by rolling my swag, nesting my billy-cans, loading my tucker-bag, and heading for the Wallaby track.

For one period of five months, I became a "Sundowner" in every sense of the word and secured my bread by any means available. During this time I didn't eat a meal at a table or sleep in a conventional bed. I worked as shed hand in a shearing-shed, as an offsider to a cook, as a harvest hand, as a prospector, as a shepherd and in various other capacities.

I probably enjoyed better health during that experience, both physically and mentally, than I have known before or since. In the back country, I met many of the original settlers who had cleared the bush for an advancing civilization that was to give the world its major wool supply.

My year and a half in Australia proved most stimulating. I met many wonderful foundrymen there, most of whom by this time probably have ended the journey; but if there should be one who reads this column and faintly remembers this Yank of 40 years ago—to him, I dedicate this effort, slightly paraphrasing the lines of Australia's own poet, Henry Lawson.

You may find in this column a trace of
That side of our past which was bright.
And recognize probably the face of
A friend, who has dropped out of sight.
I send it along in the place of
The letters—I promised to write.

New Rokide* Coatings Resist Heat and Abrasion

Rokide spray coatings help solve many high temperature and wear problems

WITH the rapid increase in modern high temperature applications there has been a corresponding increase in demands for resistant materials. Norton ROKIDE spray coatings are meeting such demands with great success. These hard, adherent crystalline refractory oxides offer many important advantages. For example:

They are both thermally and electrically insulating . . . Their hardness, chemical inertness and stability in combustion temperatures provide high resistance to excessive heat, abrasion, erosion and corrosion. Their high melting points and low thermal conductivities reduce the temperatures of the underlying materials and permit higher operating temperatures.

ROKIDE Coatings vs. Stainless Steel

Analyses of Norton ROKIDE spray coatings and of stainless steel reveal interesting comparisons. While less dense than the bare steel, the ROKIDE coatings are very much harder, have considerably higher melting points and are very much lower in thermal conductivity and thermal expansion.

Proof

There are three Norton ROKIDE coatings: ROKIDE "A" aluminum oxide, ROKIDE "ZS" zirconium silicate and ROKIDE "Z" stabilized zirconia. Thoroughly proved in such critical applications as reaction motors, as well as in AEC projects, the value of these coatings to a broad range of more conventional applications is obvious.

Applications

The versatility and adaptability of ROKIDE coatings are evident in the following list of applications, actual and suggested:

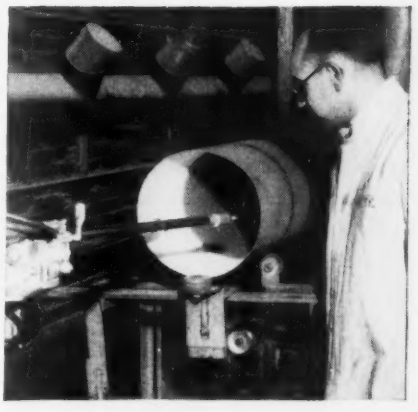
Baffle plates . . . bearing surfaces . . . mechanical seals . . . feed rolls . . . metal treads . . . thermal barriers . . . reflection coatings . . . coatings for exhaust ports, duct linings, ladles and crucibles . . . insulation for copper busbars, circuit breaker components, thermocouple wires and tubes, large and small electronic equipment . . . protection for nozzles, valve plugs, piston heads, pump shafts, gas turbine parts, etc.

Although ROKIDE coatings are most commonly applied to metals they are effective on other materials, such as ceramics and certain plastics. Thicknesses of the coatings generally range from .005″ to .05″.

Other Norton Electric Furnace Materials

are products made of CRYSTOLON* silicon carbide (including ROKIDE "C" coating for graphite parts and CRYSTOLON "N" monolithic shapes), ALUNDUM* fused alumina, MAGNORITE* magnesium oxide, NORBIDE* boron carbide and Fused Stabilized Zirconia. These high-melting materials are also the basic ingredients of the famous Norton Rx's — refractories *engineered and prescribed* for the widest range of uses.

For more detailed information on ROKIDE coatings, use the coupon.



ROKIDE Spray Coatings are applied in a molten state by means of a metalizing type spray gun. The oxide is fed into the gun in rod form at a carefully controlled rate. The coatings can be applied to parts of any size and to all shapes accessible to the spray gun equipment.

[ROKIDE Spraying Equipment Manufactured by Metallizing Company of America, Chicago 32, Illinois.]

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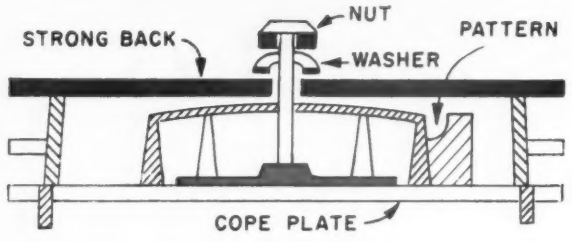
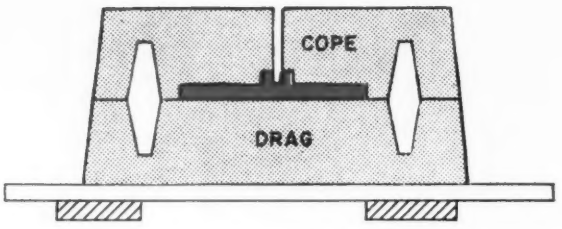
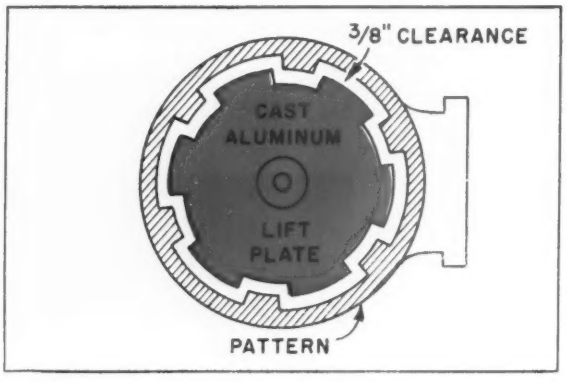
Trouble Shooting

By C. W. AMMEN







Sketches on the left show arrangement of a well rigged flask as seen from the side (top sketch) and the top (lower sketch). The drawing above illustrates a section of a completed snap mold and shows the lift plate where it remains until the shakeout

Rig Them To Run!

Dear Charlie:

You know, what with some of the help you get today to work in the foundry, it's getting rougher and rougher to come out at all. Oh, for a few good old-fashioned molders. We'd be much better off in the macaroni business—at least we could eat the macaroni. All this highbrow talk about training men, etc., sounds fine and looks good on paper and for the future, but what can a fellow do to keep her from coming unglued now? I have a job for some center sections of an electric motor—a cope and drag job: Cope on a jolt pin-lift and drag on a rollover draw. When we use a big snap, the drags are OK but we lose far too many copes because the inside section falls off or stays down, even with the pin-lift. If I had steel flasks, I could use gaggers, soldiers, etc., to assist in the cope draw. What does one do for deep draws in a snap? Should I drop green sand and jump on one of the new wonder systems?

Sincerely,
Sam

Dear Sam:

You are right about the labor situation in the foundry, and with the glamor industries going full blast, trying to interest likely young men to learn to mold, etc., in the foundry is really tough. Some shops I am acquainted with complain of as high as 300 per cent labor turnover per year. It's too simple to work for a nice, clean aircraft company or to take it easy. Make no mistake, we all are faced with the same problem. Automation, what have you, is the best direction. Many foundries have jumped too hard and too deep for some of the highly publicized new methods of casting in an effort to save themselves, only to find they are faced with not only the same old labor trouble, but with many new problems within these new methods, plus higher unit costs. Each method is in itself very worthy when applied to the correct field of use.

Now, let's go ahead and make the deep-draw motor centers or bodies in green sand and a snap. Make the drags as usual on the rollover machine. Most of these castings I have seen have a spline shape inside on which the fields are wound. I assume your casting is of this type and that the cope lift is from 4 to 6 in. or so. Wooden soldiers and light gaggers are successful only in the hands of a skilled molder and make slow work to say the least.

On large molds and loam work, lifting plates and arbors are used, and such equipment does not have to be limited to large work. In this instance, it will give you the necessary support to lift the deep cope pocket. First, make a pattern for a lift plate to conform with the inside diameter and shape of the sand body which you wish to lift, making it about $\frac{3}{8}$-in. smaller than the dimensions of the pocket at the bottom and approximately $\frac{1}{4}$-in. thick, with a centrally located boss which we will tap to take a $\frac{1}{2}$-in. lifting rod.

Next, cast up the required number of plates, depending on the production rate required. The cast plates are drilled and tapped in the center of the boss to take a $\frac{1}{2}$-in. rod threaded on both ends.

As the next step, make a wood or metal strong back which crosses over

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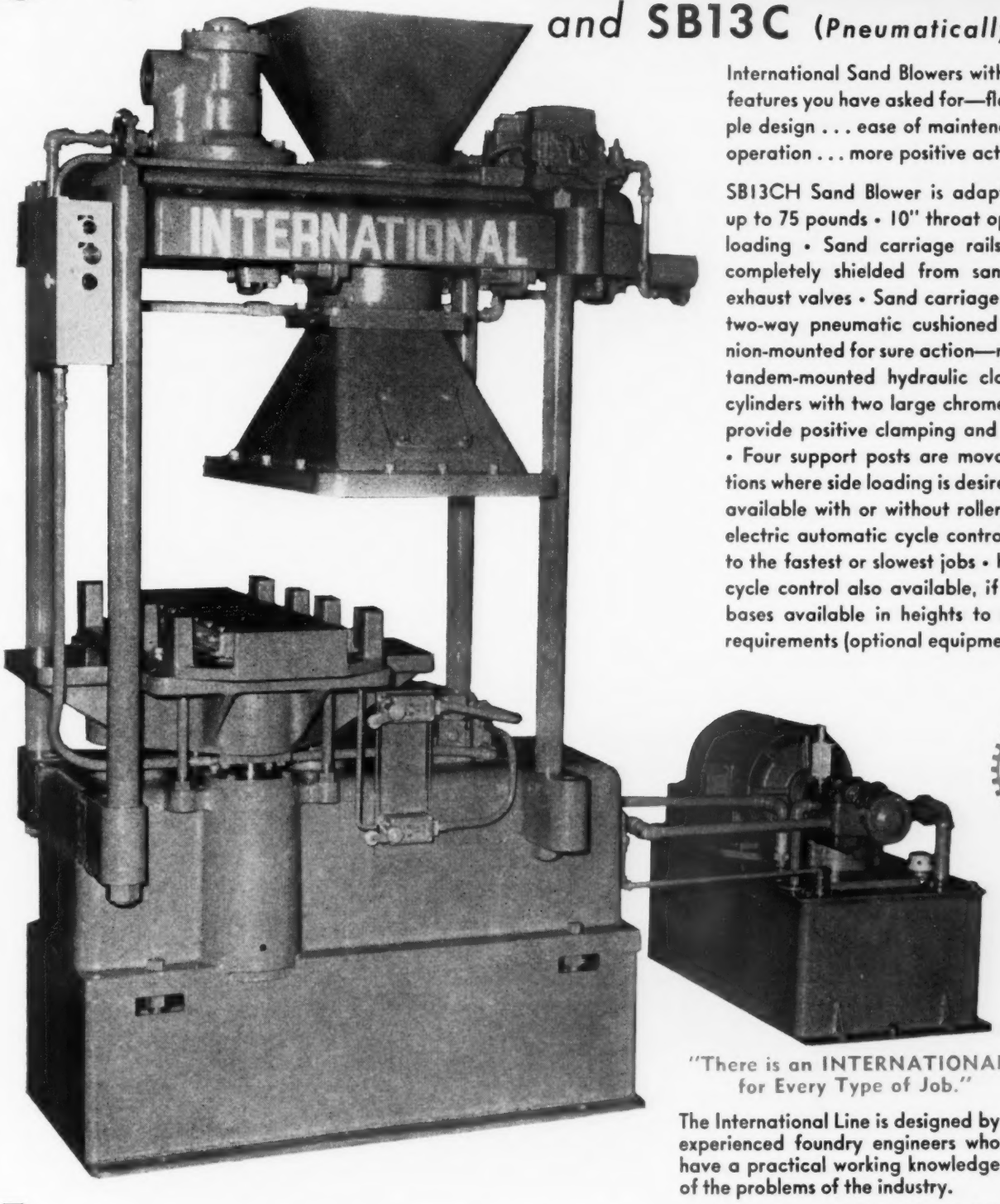

International Sand Blowers with all of the new features you have asked for—flexibility . . . simple design . . . ease of maintenance . . . faster operation . . . more positive action!

SB13CH Sand Blower is adaptable for cores up to 75 pounds • 10" throat opening for easy loading • Sand carriage rails and bearings completely shielded from sand • New-type exhaust valves • Sand carriage operated by a two-way pneumatic cushioned cylinder, trunnion-mounted for sure action—no springs • Two tandem-mounted hydraulic clamp and draw cylinders with two large chrome-plated guides provide positive clamping and accurate draw • Four support posts are movable for operations where side loading is desired • Draw table available with or without rollers • Completely electric automatic cycle control can be timed to the fastest or slowest jobs • Hand operated cycle control also available, if desired • Subbases available in heights to meet conveyor requirements (optional equipment).

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Use our specialized experience to good advantage in your foundry

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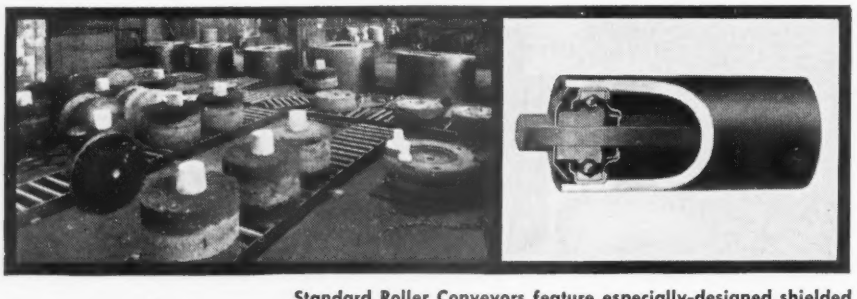
Here's your opportunity to get a perfect combination of long, dependable service with maximum flexibility. Quality-built Standard units are offered in a wide range of stock types and sizes that allow custom-engineering at standard unit prices.

Before you invest in new equipment, get the facts from Standard on powered as well as gravity conveyors in both permanent and portable models. STANDARD CONVEYOR COMPANY, General Offices: North St. Paul 9, Minnesota. Sales and Service in Principal Cities.



Standard Roller Conveyors feature especially-designed shielded bearings. On the job, shields keep out spillage and sand, give longer, trouble-free roller life.

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Sales and Service in Principal Cities.

the top of the flask with a hole in the center which clears the ½-in. threaded rod. Now we are ready to go with our copes.

In ramming up the cope, we first place the lift plate in the center of the pocket and tuck a little riddled sand in the ⅜-in. space between the plate and the pattern. Then screw the ½-in. rod into the tapped boss in the center and riddle and ram up the cope in the usual manner. Strike it off flush and leave the lift rod sticking through the top of the cope.

Next, we place our lift rod through the strong back. Place a washer and nut on the rod and pull it up firm. Lift the cope with the pin-lift, finish the cope and place it on the drag. Remove the strong back and lift rod, and then the snap. This method, you will find, is about the easiest way to run this type of a job, and the rigging cost is offset by the high production of good castings. It is far better to spend some time and money rigging a job right in the first place instead of fighting it until you are sunk or finally have to rig anyway.

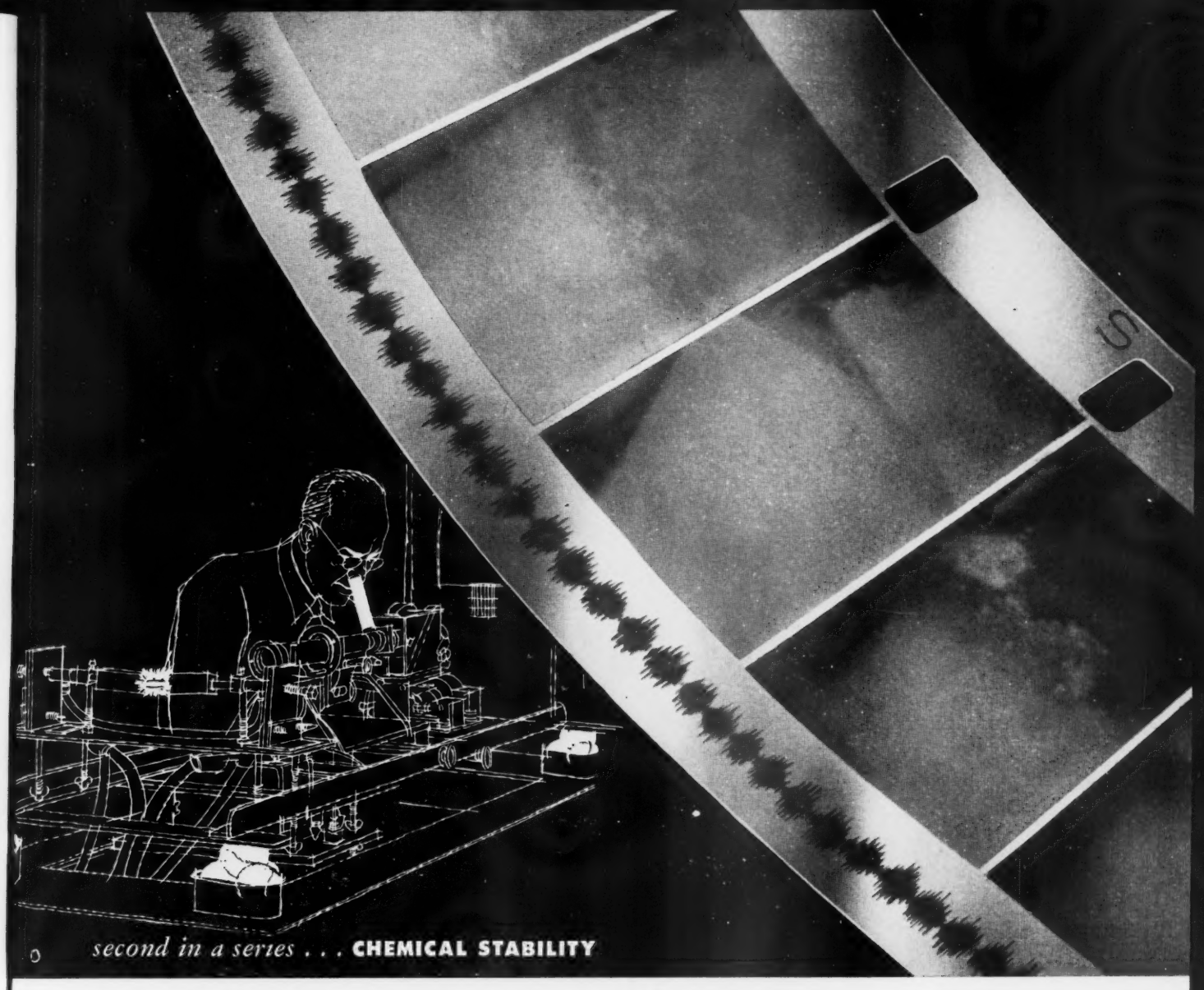
You no doubt have heard the old story of the job around town where foundry "X" had it, but could not make out and lost it to foundry "Y," which ran hell out of it for years. Five will get you ten that "Y" spent some time, money and brains rigging the job so that it could be run properly. Money, time and thought can, if properly applied, raise Cain with your competition. Show me a foundry that has a good, tricky rigger with a sack of tricks, and I'll show you a good shop.

Rig her right from the start—don't let "Y" foundry take it away from you and rig it. How many times have I heard fellows say, we could have made that job if we had gone to all the trouble of making crabs, arbors, etc., as those guys did. Sam, remember the local shop which for years and years made all the city's street castings until some sharp operator 400 miles away bought a slinger and rigged hell out of the job? You bet you do—we were pallbearers at the funeral!

Sincerely,
Charlie

Link-Belt Co. Moves Offices

Link-Belt Co. has moved its executive offices to the new Prudential Building in Chicago, where the company will occupy the entire 17th floor. The new address is Prudential Plaza, Chicago 17.



Comparative stability of MONOFRAX® fused cast refractory (left) vs. fireclay (right) . . . under attack by molten glass, as viewed through the high temperature microscope — one of Carborundum's most useful test facilities. (16 mm. frames shown are not consecutive.)

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CARBORUNDUM'S laboratories are constantly developing new super refractories to meet specialized application problems. Current research projects include refractory materials for guided missile components, for atomic reactors, and for applications where wear and corrosion are unusually severe.

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ACTIVITIES of Foundry Groups

Cleveland Non-Ferrous: Members of the Cleveland Chapter met Feb. 16 at the Cleveland Athletic Club to hear Walter Duryea, Whitehead Brothers Co., Columbus, O., discuss foundry sands. Mr. Duryea was assisted by Lee Hutson, Whitehead Bros. Co., Columbus.

After showing a film on how sands were deposited on the East Coast and are mined, Mr. Duryea spoke on synthetic sands in nonferrous foundries. High production, he said, calls for new techniques. Sand must be as cheap as possible, flow through equipment, mold easily, stand up during pouring, collapse easily and give easy cleaning. Control is the way to achieve such a sand. Trial and error is a poor method: Too many foundrymen look for remedies instead of causes.

Because lack of control causes problems, a foolproof sand is necessary. Synthetic sand fills the bill. It requires only a muller to mix it. Mr. Duryea recommended a synthetic sand facing with a natural sand backing. Synthetic sand from the shakeout will improve the sand heap. Preferred bond for both aluminum and brass is southern bentonite, but a little western can be used if cutting and washing occur. Southern bentonite is considered best for good shakeout characteristics.

Cereals can eliminate some scabbing, ramming and buckling defects, but hamper flow of sand and cause rough castings. Maximum carbon should be 2½-3 per cent. Too much causes "zinc-worm" defect. Hard maplewood flour is the best stabilizer. The proper proportion of moisture varies with fineness of the sand. Add diethylene glycol to prevent drying out. Aeration promotes workability of the sand.

For natural sands, Mr. Duryea advised against use of bentonites. Many natural sands require too much moisture for best results from them, he said. Bentonites give up moisture more easily than natural clays. Mr. Duryea advised use of Albany sands for flowability, but not when high strength is required, unless clay is added. Albany deposits are nowhere near depletion, he stated, nor has the quality changed—*Jack C. Miske*

Connecticut: The AFS chapter met Feb. 28 at Waverly Inn, Cheshire, Conn., to hear Hans J. Heine, technical director, AFS, speak on "New Horizons in Foundry Progress." Mr. Heine pointed out that potentials of the industry are tremendous and then elaborated on the many changes currently taking place that are laying the groundwork for improved practice and methods in the future.

Research in unexploited metals together with development of popular metals and methods, vacuum melting, metallurgy of minute alloy additions, vacuum degassing, high-pressure

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agents, horizontal pouring, mold coatings, shell cores, sand additives for controlling chill, CO_2 process, olivine sands, automation, safety, air pollution, noise control and hygiene legislation were all touched upon in light of the possible effects they will have upon the foundry of the future. *—Gordon B. Mannweiler, Eastern Malleable Iron Co.*

Northeastern Ohio: Nearly 200 foundrymen and guests gathered at the Tudor Arms Hotel, Cleveland, on Feb. 9 to hear Robert M. Ling, assistant to the president, Dike-O-Seal Inc., Chicago, describe "Improvement of Coreblowing Techniques."

Mr. Ling opened his talk with a discussion of blow-by in coreboxes. He characterized it as expensive because it wears coreboxes, causes poor cores and wastes compressed air and core sand. In addition, it is dangerous, particularly to eyes. It adds to labor costs by requiring that cores be patched and/or trimmed. Worst of all, if blow-by causes a poor core which is used, it means a scrap casting.

Many attempts have been made to prevent blow-by, but most of them only create new problems. These attempts have included greater closing pressure, rubber compression seals, vents, calking and other measures. Each has its own disadvantages.

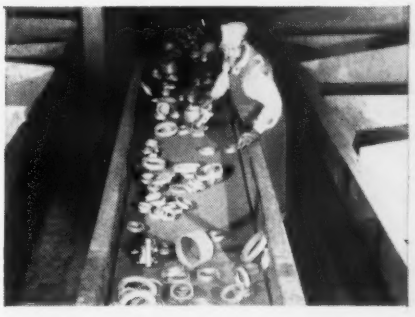
Mr. Ling then described the type of seal developed by his company. It uses a spongy rubber seal which is built into the box, the rubber on one half fitting into a channel tooled into the other half, affording metal-to-metal contact at all times. The seal design differs in varying types of coreboxes; venting, blow pressure, etc., are adapted to individual coreboxes.

Mr. Ling also described a very thin polyethylene pad his firm builds into boxes at the bottom, where blow-in strikes, which has withstood as many as 5400 blows.—*Jack Miske.*

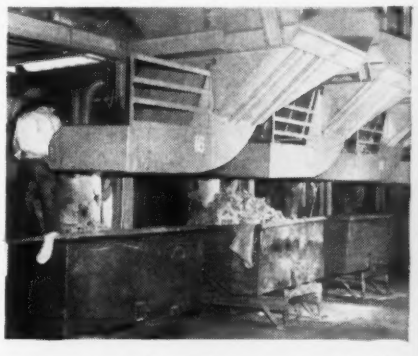
Chicago: The three-session lecture course on "Product Improvement" which the AFS chapter arranged for its 1956 educational program was launched at the group's Mar. 5 meeting. N. Levinsohn, foundry superintendent, Minneapolis-Moline Co., Minneapolis, presented the introductory lecture on "Producing Quality Castings," and set the stage for two lectures scheduled to follow.

Scheduled for Mar. 12 was Harold H. Johnson, director of research, National Malleable & Steel Castings Co., Cleveland, speaking on "Exist-

1. Castings come from heat treat to receiving station in furnace trays which are dumped automatically. An inclined conveyor then raises castings to upper level sorting belt.



2. Castings are picked from sorting belt and dropped into segregating hoppers. Any castings missed as they pass their particular segregating stations are recirculated back past the stations automatically. This system is very flexible, since many different castings can be sorted; or the same volume, but with only a few different castings, may be sorted.



3. The sorted castings are carried by gravity from the segregating hoppers to a convenient work level at the grinders. After grinding they are dropped into dump hoppers for distribution.

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ing Foundry Processes and How To Improve Them," and for March 19 Robert F. Thomson, staff member, General Motors Corp., Detroit, lecturing on "Planning for the Twentieth Century Foundry."

In prefacing his address, Mr. Levinsohn commented that much has been heard of quality castings in the last ten years and unfortunately there are those who believe the procedure for getting them is something for big foundries to work out first. On the contrary, the speaker emphasized, any foundry can achieve quality control by giving proper attention to factors involved.

Requisites for quality castings from the purchaser's standpoint, he continued, are smooth finish, freedom from blowholes and shrinks, freedom from scabs, trouble-free machining, correct dimensions, close tolerances and lowest price.

Mr. Levinsohn was emphatic that quality castings can be produced if the production control procedure embraces: Specifications for molding and core sands, good gating and risering practice, correct metal composition and temperature, and the intense desire to produce quality castings permeating the organization from top management through production workers.

In his presentation, the speaker used slides showing records and charts which must be kept to insure constant control over all factors which have an influence on casting quality.

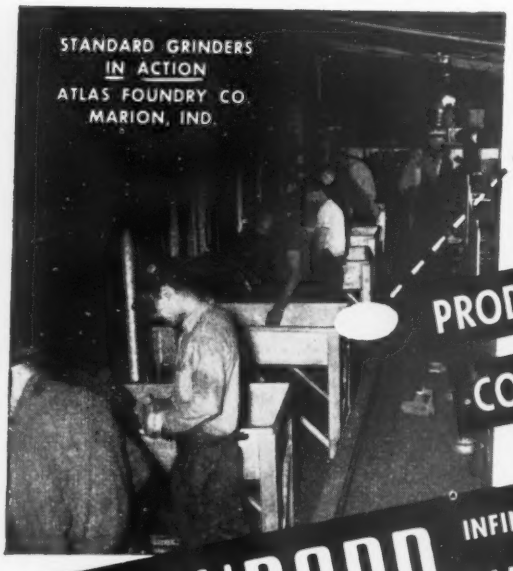
Four roundtables will feature the chapter's Apr. 2 meeting. The Maintenance, Malleable and Gray Iron divisions will combine to consider "Wet and Dry Sand Reclamation." Steel division will discuss "Use of Oxygen for Steel Melting;" Nonferrous division will investigate "Melting Fluxes and Refractories;" and the Pattern division will look into "Patterns for Modern Processing."—*Erle F. Ross.*

Lehigh Valley: Lehigh Valley Foundrymen's Association met Feb. 14 at Hogg Hall on the campus of Lafayette College, Easton, Pa. Ray Olson, sales manager, Shell Process Inc., Chicopee, Mass., spoke on "Shell Molding" and presented slides showing shell molding and coremaking equipment in operation. One hundred twenty-five persons were attracted to the meeting.

Technical talk was preceded by a coffee talk by H. E. Cragin Jr., plant manager, Taylor-Wharton Iron & Steel Co., High Bridge, N. J., on skiing as recreation. Hans Jacob, foundry superintendent, Lehigh Inc., presided and Frank Cox, foundry superintendent, Taylor-Wharton Iron & Steel Co., served as technical chairman.—*R. B. Fischer, Ingersoll-Rand Co.*

Central Ohio: Two Ohio State University students presented papers relative to investigations of current interest to themselves at the Feb. 13 meeting of the AFS chapter at the Seneca Hotel, Columbus, O. George B. Greenwood discussed a room temperature curing binder for cores and dry sand molds. Orald L. Stewart presented a study on cupola air supply and design of a split-type baby cupola—*Jose Acebo, Ohio Malleable Division, Dayton Malleable Iron Co.*

Pittsburgh: Members of the AFS chapter met Feb. 20 at Webster Hall Hotel, Pittsburgh, to hear Harold H. Johnson, director of research, National Malleable & Steel Castings Co., Cleveland. Mr. Johnson's talk, "Control of Gases in Steel Castings," concerned sources of gases and pos-



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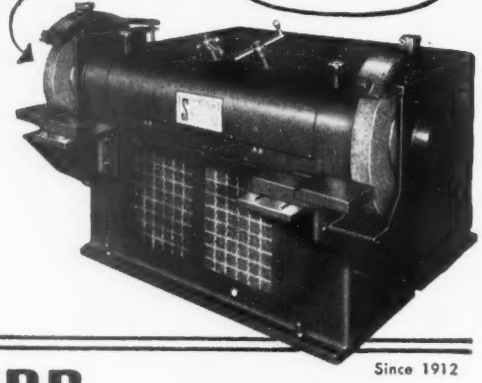

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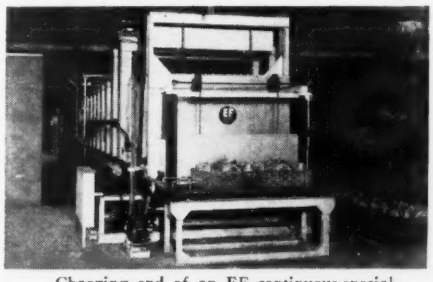
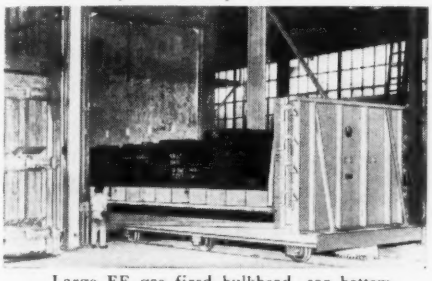


Charging end of an EF continuous special atmosphere furnace handling short cycle malleable castings. Shows 2 baskets of castings ready for pushing thru furnace in 2 parallel rows. The castings are uniformly treated in a special atmosphere produced by an EF generator—no packing material is needed.

A battery of large El fuel fired batch type furnaces with quenching equipment. Gantry crane handles large castings or other products into and from the furnaces or quench. This type also used for annealing, normalizing and other heating and quenching processes on weldments, forgings, plate, coiled strip and other products.



Large EF gas fired bulkhead, car bottom type furnaces with motorized car and door operating equipment and automatically controlled heating zones are used for uniformly annealing large castings, stress relieving weldments and other processes.

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sible process controls. About 110 members attended.

Hot tears and porosity are twin enemies to steel foundrymen and there is no certain way to anticipate when trouble will begin. Speaker showed the effects of too much hydrogen in metal and summarized the effects of hydrogen on casting soundness. He suggested that the steel melter has the best opportunity to control gas content. Regardless of the melting unit, the only way to control gases is to control each step in the melting process.—*Robert M. Love.*

Ontario: Ferrous and nonferrous sections of the AFS chapter held group sessions at the Feb. meeting at the Royal Connaught Hotel, Hamilton, Ont. John Perkins, Ford Motor Co. of Canada, was chairman of the ferrous section. Panel members and their discussion subjects were: A. Jamieson, Canada Iron Foundries, "Charging and Light-Up Practice," J. Marrack, McKinnon Industries Ltd., "Air Placement Method," and J. N. Chappel, Ford Motor Co., "Front Slagging Practice vs. Rear Slagging Practice."

J. Morgan, Foundry Services (Canada) Ltd., chairmanned the nonferrous session. W. H. Irwin, Canada Metal Co., described a bronze centrifugal casting process newly introduced to Canada from Germany by Mr. Irwin's company. Flawless material, reduced machining time and long wearing properties are a few of the advantages claimed for castings made by the process. Slides and film were shown to give members a better understanding of the process—*Len Humphreys, A. H. Tallman Bronze Co.*

Detroit: James H. Smith, general manager, Central Foundry Division, General Motors Corp., Saginaw, Mich., spoke before the AFS chapter at its Feb. 16 meeting at the Tuller Hotel, Detroit. Mr. Smith's talk, "To Meet the Challenge," is presented in an article on page 96 of this issue.—*A. D. Postma.*

Connecticut Non-Ferrous: Connecticut Non-Ferrous Foundrymen's Association held its Jan. 18 and Feb. 15 meetings at the Quinnipiack Club, New Haven, Conn. At the January meeting, Donald R. Jefferson, quality control engineer, Aluminum Co. of America, Bridgeport, Conn., talked on "Applying Quality Control Methods to a Foundry Operation." At the February

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meeting, J. Donald Pisula, manager, Refractory Products Sales, Corning Glass Works, Corning, N. Y., spoke on the "Corning Glascast Process."

Mr. Jefferson indicated that quality control is another method for converting the foundry industry from an art to a science in that it describes variables in numerical terms so that they may be attacked scientifically. The purpose of quality control—that of producing a uniform product at minimum cost—can be achieved by using a common-sense approach alone or an approach based on the use of statistical methods.

The two methods also can be combined. Every process consists primarily of incoming material, existing conditions, a human variable and a finished product. Control of these four factors means control of the process. Since it is difficult to analyze the complex foundry process, it can be subdivided into a number of simpler processes that can be controlled. In controlling the simpler processes, the overall variability is reduced, resulting in a more uniform product and a successful quality control program for the foundry.

Mr. Pisula explained the basic process of using silica glass for molds in casting metals. He stated the process has advantages over lost wax and other investment methods of casting where precision, time element and tooling are of importance. Mold material is reclaimable and in some instances the mold can be used many times over.

Due to its low and uniform expansion coefficient, the castings produced by this process are exceptionally accurate, some being produced to 20 and 40 microinches in surface finish and 0.005-in. tolerance with as high as 90 per cent good castings in precision work.—*Frank B. Diana.*

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Philadelphia: One hundred ten members and guests of the AFS chapter met at the Engineers Club, Philadelphia, on Feb. 10 to hear William G. Gude, managing editor, FOUNDRY, review what has happened in the foundry industry in the last ten years and point out some of the trends that are indicated for the future.

Chapter's educational committee, under the direction of Edwin A. Zeeb, Dodge Steel Co., and E. H. Enderlein, Enderlein Foundry, has presented a series of roundtable meetings and plant visitations covering all phases of the industry. With the meeting season coming to a close, two visitations are on the schedule for April—the Steel group will visit the General Steel Castings Co., Eddystone, Pa., on Apr. 6 and the Gray Iron group will visit the Florence Pipe Foundry & Machine Co., Florence, N. J., on Apr. 20.—*Charles R. Sweeny, Atlantic Steel Castings Co.*

Western Michigan: Bill Sterns, Muskegon, Mich., was the location for the Feb. 6 meeting of the AFS chapter. Wayne H. Buell, executive vice president, Aristo Corp., spoke on "An Outline of Evaluation and Quality Control of Core Oils."—*Joe Cannon, Muskegon Aluminum Foundry Co.*

Washington: Forty members attended the Feb. 16 meeting of the AFS chapter at the Stewart Hotel, Seattle, Wash. Dean E. Shull, technical representative, Pure Carbonic Co., spoke on the CO_2 process and presented the process as another tool for foundrymen—not a cure-all. The method was explained and the ma-

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terials and equipment required were given special attention. Cores were made following the meeting. A film on the subject also was shown.—*E. F. Riedle, Puget Sound Naval Shipyard.*

New England: About 100 members of the New England Foundrymen's Association assembled at the University Club, Boston, Mass., on Feb. 8 and heard Frank G. Steinebach, editor, FOUNDRY, discuss "Can We Sell More Castings?"

Mr. Steinebach emphasized that more castings can be sold if the industry does a better job of merchandising. Production, research, pricing, selling and promotion are the five important aspects of a total merchandising package and each must receive attention if the industry is to move forward. It is vital also that the foundry industry look for new business in applications now being served by other means of fabrication. — *Frank S. Holway, Mystic Iron Works.*

Texas: Fifth meeting of the season for the AFS chapter attracted 65 members and guests to Hotel White Plaza, Dallas, on Jan. 20 to hear Howard H. Wilder, Iron Foundry Division, Vanadium Corp. of America, Detroit, discuss "Cupola Practice." Mr. Wilder's talk was illustrated and presented from the viewpoint of the development work being carried on by the AFS rather than that of any individual manufacturer. W. A. Bearden, M. A. Bell Co., served as meeting and program chairman—*J. S. Ahrens, National Carbon Co.*

Conestoga: Louis Dill, sales manager, George F. Pettinos Inc., Philadelphia, spoke to the Conestoga Foundrymen's Association at Lancaster, Pa., on Feb. 18, on "Foundry Sands and Additives." Following the talk a panel discussion was held. Panel members, in addition to Mr. Dill, were Daniel J. Jones, New Jersey Silica Sand Co., Millville, N. J., Ben Beldin, Whitehead Bros., New York, N. Y., and Walter S. Trout, George F. Pettinos Inc.

Southern California: Dean E. Shull, technical representative, Pure Carbonic Co., spoke before the AFS chapter on Feb. 10 at the Rodger Young Auditorium, Los Angeles. Mr. Shull's subject was the "CO_2 Process."—*Edwin J. Worth, Howell Foundry Co.*

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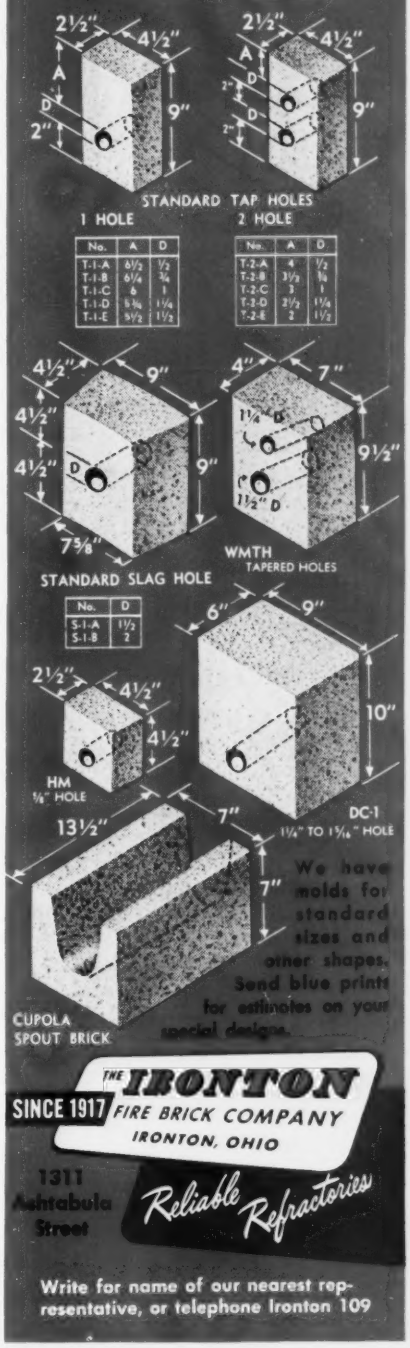

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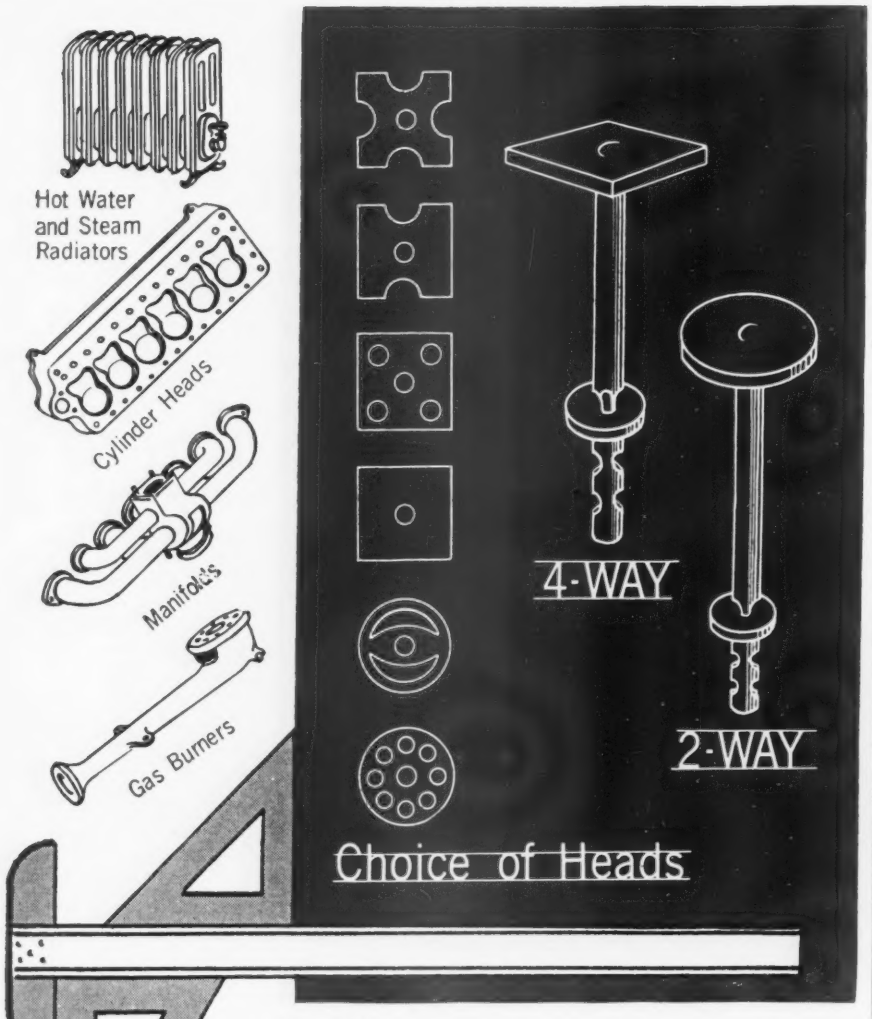

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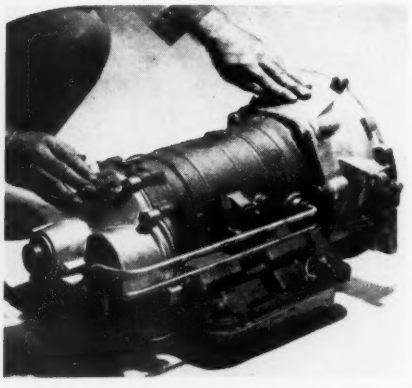
Applications of Aluminum Increase in 1956 Autos

Record 246 Million Pounds May Be Used This Year

The amount of aluminum used in the average automobile has increased from 29.6 lb in 1955 to 35.2 lb in 1956 models, according to a survey by Aluminum Co. of America, Pittsburgh. With production of cars in 1956 estimated at 7 million units, a record-breaking 246 million lb of aluminum will be used in autos if the production estimate is met.

Nearly 50 per cent of the aluminum in passenger cars goes into automatic transmissions. Another major application of the metal is in engines, now utilizing 30 per cent of the total. Body trim accounts for another 7 per cent, and the balance goes into miscellaneous applications such as wiring, brakes, power steering and air conditioning units.



Flywheel housing and rear bearing retainer in 1956 Pontiac are aluminum

The Alcoa survey offers several reasons for the increased application of aluminum. The trend to V-8 engines was important because such power plants require more of the metal than 6-cylinder units. Another factor was the change in the design of General Motors' automatic transmission, a change which requires an additional 14 lb of aluminum per unit.

Growing applications of aluminum die castings added to the increase in 1956. The survey reveals that die casting is the principal production method employed for aluminum auto parts. New models average 15.7 lb of aluminum die castings per car, compared with 12.3 lb in 1955 models.

Alcoa predicts that the next important advances for aluminum in automobiles will be aluminum radiator fins joined to brass tubing. Eventually, auto radiators may be all al-

uminum. Engine blocks and heads offer further possibilities, as do brake drums and differential housings.

Looking ahead, the survey indicates that aluminum applications on autos will rise to 49.8 lb by 1960 and to 81 lb by 1965. If aluminum were applied to all automotive parts which can be converted to its use, the total on each car would top 300 lb. Pointing up the trend to use of aluminum, Ford Motor Co., Detroit, has announced planned construction of an aluminum permanent mold and die casting foundry at Listerhill, Ala., which will use 64 million lb of aluminum per year. The metal will be supplied in the molten form by a new reduction plant to be built adjacent to the foundry by Reynolds Metal Co., Louisville.

Alcoa Publishes Volume on Brazing of Aluminum

Practical shop data and up-to-date developments in the brazing of aluminum are presented in *Brazing Alcoa Aluminum*, a new book published by Aluminum Co. of America. This volume, along with a volume on welding, succeeds an earlier publication, *Welding and Brazing Alcoa Aluminum*.

Descriptions of brazing materials and the considerations involved in designing, preparing and assembling brazed joints are treated fully. The torch, furnace and dip brazing processes are described in detail. A tabular section contains answers to most of the routine questions concerning brazing methods and materials.

Copies may be obtained by writing on company letterhead to Aluminum Co. of America, 774 Alcoa Bldg., Pittsburgh 19.

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Ansul Chemical Co. Conducts Free Fire-Fighting Courses

Ansul Chemical Co., Marinette, Wis., will conduct 14 three-day fire training courses on its 10-acre fire test field during 1956. Registration for the no-tuition courses is on a first-come, first-served basis, and each class will be limited to 25 men.

Ansul instructors will teach the latest techniques in fire extinguishment. Students will be taught how to use hand, wheeled and large stationary fire equipment against flammable liquid and propane gas fires so that they will be able to train members of their own plants in fire-fighting techniques. The school schedule also calls for group discussions, motion picture film showings and a plant tour.

Dates of the courses are May 21-23; June 4-6, 11-13, 18-20 and 25-27; July 9-11, 16-18, 23-25 and 30-Aug. 1; Aug. 20-22 and 27-29; Sept. 17-19 and 24-26; and Oct. 8-10. Additional information may be obtained by writing to the Director, Customer Training School, Ansul Chemical Co., Marinette, Wis.

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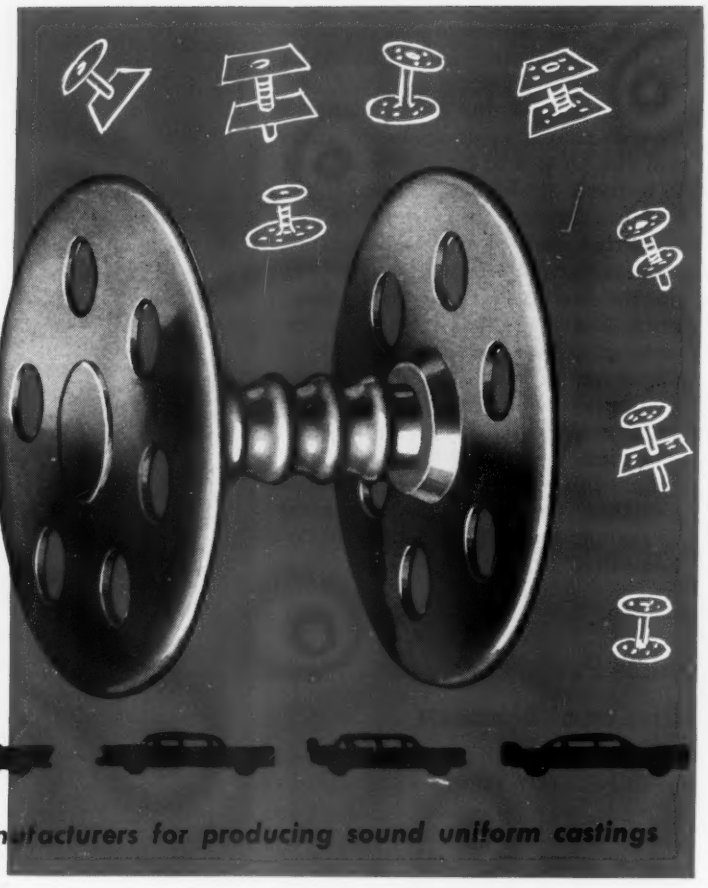

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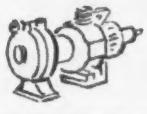
pumps	
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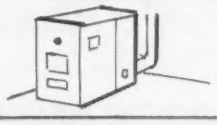
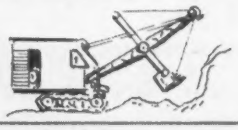
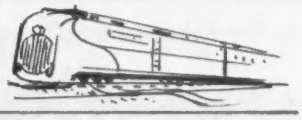
furnaces	
road machinery	
locomotives	
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Many cases will occur in constructing and laying-out patterns, where a square protractor or bevel cannot be used, and in such cases the accompanying tables will be of service. It will be observed that the 10-inch radius can be easily taken on a 12-inch scale, the 22-inch radius on a 24-inch scale, and the 48-inch radius by laying down two lengths of the 24-inch scale.

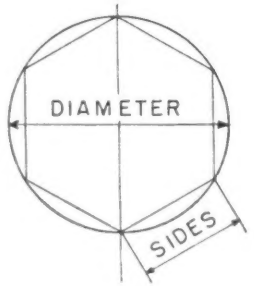
To lay out the required angle, scribe an arc, using one of the given radii, then set the trammels to the length of the chord given in the tables for the required angle, lay out on the circle and connect these points with the center.

Angle in degrees	10-inch radius chord	22-inch radius chord	48-inch radius chord
1	1/64	3/8	1/8
2	3/64	49/64	1 11/16
3	3/64	1 9/64	2 1/2
4	5/64	1 33/64	3 23/64
5	7/8	1 53/64	4 11/64
6	1 9/64	2 5/16	5 9/64
7	1 27/32	2 11/16	5 59/64
8	1 25/32	3 1/16	6 53/64
9	1 37/64	3 29/64	7 17/32
10	1 3/4	3 53/64	8 23/64
11	1 59/64	4 31/64	9 7/32
12	2 3/32	4 15/32	10 1/32
13	2 17/64	4 31/32	10 57/64
14	2 7/16	5 3/8	11 53/64
15	2 39/64	5 47/64	12 29/64
16	2 51/64	6 7/64	13 11/32
17	2 31/32	6 33/64	14 13/64
18	3 3/64	6 57/64	15 1/64
19	3 15/64	7 17/64	15 53/32
20	3 15/32	7 5/8	16 31/32
21	3 41/64	8 1/64	17 49/32
22	3 59/64	8 13/32	18 41/64
23	4	8 25/32	19 5/32
24	4 5/32	9 5/32	19 31/32
25	4 31/64	9 17/32	20 29/32
26	4 1/2	9 29/32	21 33/64
27	4 43/64	10 5/32	22 13/32
28	4 57/64	10 11/64	23 1/64
29	5 1/64	11 1/64	24 3/64
30	5 1/16	11 25/64	24 59/64
31	5 11/32	11 47/64	25 11/64
32	5 33/64	12 1/8	26 7/16
33	5 11/16	12 1/2	27 3/32
34	5 55/64	12 7/8	28 5/64
35	6 1/64	13 3/32	28 57/32
36	6 1/16	13 19/32	29 21/32
37	6 23/64	13 31/32	30 31/64
38	6 33/64	14 21/64	31 13/64
39	6 11/16	14 11/16	31 55/64
40	6 27/32	15 3/64	32 53/64
41	7	15 13/32	33 39/64
42	7 1/64	15 29/32	34 25/32
43	7 21/64	16 1/8	35 1/16
44	7 1/2	16 31/64	35 61/64
45	7 31/32	16 63/64	36 59/32
46	7 25/32	17 1/16	37 31/64
47	7 31/32	17 17/32	38 1/4
48	8 1/8	17 7/8	39 1/64
49	8 19/64	18 15/64	39 61/64
50	8 39/64	18 15/32	40 5/16
51	8 39/64	18 15/16	41 21/64
52	8 43/64	19 19/64	42 3/32
53	8 49/64	19 5/8	42 13/16
54	9 5/64	19 31/32	43 37/64
55	9 1/4	20 1/64	44 13/32
56	9 25/64	20 31/32	45 5/64
57	9 29/64	20 63/64	45 61/64
58	9 15/32	21 1/32	46 1/16
59	9 59/64	21 33/64	47 3/32
60	10	22	48
61	10 5/32	22 31/64	48 15/64
62	10 5/16	22 31/32	49 7/16
63	10 39/64	22 63/64	50 5/32
64	10 49/64	23 31/64	50 7/8
65	10 3/4	23 33/64	51 39/64
66	10 27/64	23 61/64	52 17/64
67	11 3/64	24 3/32	53
68	11 5/16	24 15/32	53 31/32
69	11 23/64	24 59/64	54 25/64
70	11 31/64	25 1/64	55 3/64
71	11 39/64	25 33/64	55 33/64
72	11 47/64	25 7/8	56 7/16
73	11 59/64	26 5/16	57 1/8
74	12 3/64	26 31/64	57 61/64
75	12 11/64	26 47/64	58 27/64
76	12 5/16	27 3/64	59 3/64
77	12 23/64	27 35/64	59 47/64
78	12 15/32	27 11/16	60 7/16
79	12 33/64	27 53/64	61 3/64
80	12 51/64	28 1/64	61 53/64
81	13	28 37/64	62 3/8
82	13 1/8	28 55/64	62 31/32
83	13 1/4	29 5/32	63 33/64
84	13 3/8	29 7/16	64 1/32
85	13 33/64	29 33/32	64 57/64
86	13 41/64	30	65 13/32
87	13 49/64	30 1/64	66 3/32
88	13 57/64	30 1/16	66 61/64
89	14 1/64	30 33/32	67 19/64
90	14 9/64	31 7/64	67 7/8

CHORDS OF ANGLES FROM ONE TO NINETY DEGREES

Angle in degrees	18-inch radius chord	36-inch radius chord	72-inch radius chord	Angle in degrees	18-inch radius chord	36-inch radius chord	72-inch radius chord
1	5/16	5/8	1 1/2	46	14 1/16	28 1/8	56 1/4
2	5/8	1 1/4	2 1/2	47	14 3/8	28 3/4	57 1/2
3	15/16	1 7/8	3 3/4	48	14 11/16	29 3/8	58 3/4
4	1 1/4	2 1/2	5	49	14 15/16	29 7/8	59 3/4
5	1 9/16	3 1/16	6 1/8	50	15 5/16	30 5/8	61 1/4
6	1 7/8	3 3/4	7 1/2	51	15 1/2	31	62
7	2 3/16	4 3/8	8 3/4	52	15 13/16	31 5/8	63 1/4
8	2 1/2	5 1/16	10 1/16	53	16 1/16	32 1/8	64 1/4
9	2 13/16	5 5/8	11 1/4	54	16 1/2	32 1/2	65 3/8
10	3 1/16	6 1/8	12 3/16	55	16 5/8	33 1/4	66 1/2
11	3 7/16	6 7/8	13 3/4	56	16 7/8	33 3/4	67 3/4
12	3 11/16	7 3/8	15 1/16	57	17 1/4	34 1/2	68 7/8
13	4 1/16	8 1/16	16 1/8	58	17 5/16	34 5/8	69 1/16
14	4 3/8	8 3/4	17 1/2	59	17 5/8	35 1/4	70 1/2
15	4 11/16	9 3/8	18 3/4	60	18	36	72
16	5	10 1/16	20 1/16	61	18 1/4	36 1/2	73 1/16
17	5 5/16	10 5/8	21 1/16	62	18 5/16	37 1/16	74 1/8
18	5 5/8	11 1/4	22 1/2	63	18 11/16	37 5/8	75 1/4
19	5 15/16	11 7/8	23 3/4	64	19 1/16	38 1/16	76 1/16
20	6 1/4	12 1/2	25	65	19 11/16	38 11/16	77 3/8
21	6 9/16	13 1/8	26 1/4	66	19 13/16	39 7/16	78 7/8
22	6 7/8	13 3/4	27 1/2	67	19 7/8	39 3/4	79 1/2
23	7 1/16	14 1/8	28 1/4	68	20 1/8	40 1/4	80 1/2
24	7 3/8	14 3/4	29 1/16	69	20 3/16	40 5/16	81 1/16
25	7 3/4	15 3/8	31 1/4	70	20 1/4	41 1/4	82 1/2
26	8 1/16	16 1/8	32 1/4	71	20 5/16	41 1/16	83 5/8
27	8 1/16	16 1/8	33 5/8	72	21 1/16	42 1/16	84 1/16
28	8 1/16	17 1/16	34 1/16	73	21 1/16	42 1/16	85 1/16
29	9 1/16	18 1/16	36 1/16	74	21 1/16	43 1/16	86 1/16
30	9 1/16	18 1/16	37 1/16	75	21 1/16	43 1/16	87 1/16
31	9 5/8	19 1/16	38 1/16	76	22 1/16	44 1/16	88 1/16
32	9 15/16	19 15/16	39 1/16	77	22 1/16	44 1/16	89 1/16
33	10 1/16	20 1/16	40 1/16	78	22 1/16	45 1/16	90 5/8
34	10 1/16	21 1/16	42 1/16	79	22 1/16	45 1/16	91 1/16
35	10 1/16	21 1/16	43 1/16	80	23 1/16	46 1/16	92 1/16
36	11 1/8	22 1/4	44 1/2	81	23 3/8	46 3/4	93 1/16
37	11 1/16	22 1/16	45 1/16	82	23 1/16	47 1/16	94 1/16
38	11 1/16	23 1/16	46 7/8	83	23 1/16	47 1/16	95 1/16
39	12 1/16	24 1/16	48 1/16	84	24 1/16	48 1/16	96 1/16
40	12 5/16	24 5/8	49 1/4	85	24 1/16	48 1/16	97 1/16
41	12 1/16	25 1/16	50 1/16	86	24 1/16	49 1/16	98 1/16
42	12 1/16	25 1/16	51 1/16	87	24 1/16	49 1/16	99 1/8
43	13 1/16	26 1/16	52 1/16	88	25	50 1/16	100 1/16
44	13 1/16	26 1/16	53 1/16	89	25 1/16	50 1/16	100 1/16
45	13 1/16	27 1/16	55 1/16	90	25 1/16	50 1/16	101 1/16

TABLE OF DIMENSIONS OF POLYGONS

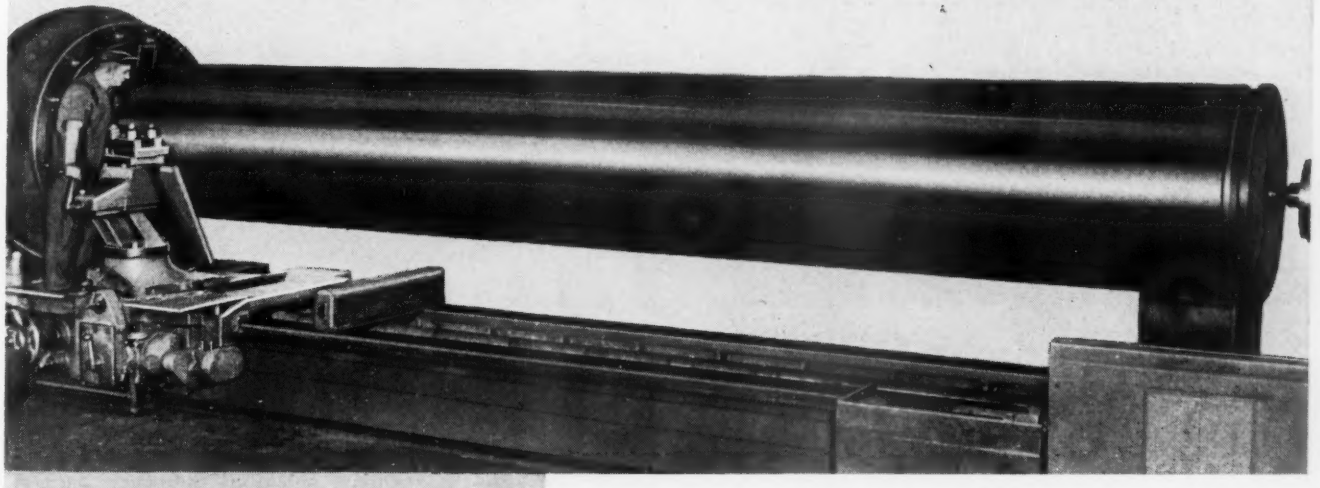


$$\text{Co-efficient} = \frac{\text{Diameter}}{\text{Side}} \qquad \text{Side} = \frac{\text{Diameter}}{\text{Co-efficient}}$$

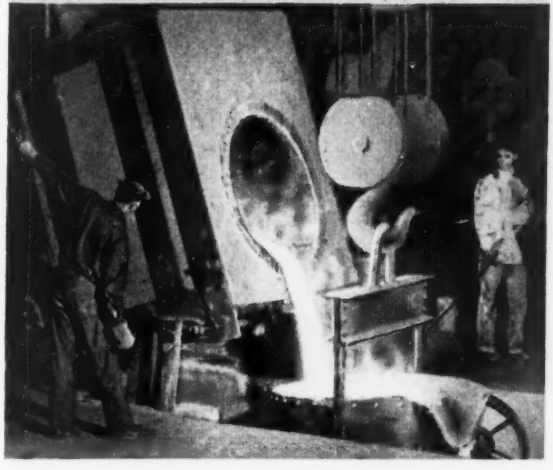
$$\text{Diameter} = \text{Co-efficient} \times \text{Side}$$

No. of Sides	Coef.	No. of Sides	Coef.	No. of Sides	Coef.	No. of Sides	Coef.	No. of Sides	Coef.	No. of Sides	Coef.
3	1.16	28	8.93	53	16.88	78	24.83	103	32.79	128	40.75
4	1.41	29	9.25	54	17.20	79	25.15	104	33.11	129	41.07
5	1.70	30	9.57	55	17.52	80	25.47	105	33.43	130	41.38
6	2.00	31	9.88	56	17.83	81	25.79	106	33.74	131	41.70
7	2.31	32	10.20	57	18.15	82	26.11	107	34.06	132	42.02
8	2.61	33	10.52	58	18.47	83	26.43	108	34.38	133	42.34
9	2.93	34	10.84	59	18.79	84	26.74	109	34.70	134	42.66
10	3.24	35	11.16	60	19.11	85	27.06	110	35.02	135	42.98
11	3.55	36	11.47	61	19.42	86	27.38	111	35.34	136	43.29
12	3.86	37	11.79	62	19.74	87	27.70	112	35.65	137	43.61
13	4.18	38	12.11	63	20.06	88	28.02	113	35.97	138	43.93
14	4.49	39	12.43	64	20.38	89	28.33	114	36.29	139	44.25
15	4.81	40	12.74	65	20.70	90	28.65	115	36.61	140	44.57
16	5.12	41	13.06	66	21.02	91	28.97	116	36.93	141	44.88
17	5.44	42	13.38	67	21.33	92	29.29	117	37.25	142	45.20
18	5.76	43	13.70	68	21.65	93	29.61	118	37.56	143	45.52
19	6.07	44	14.02	69	21.97	94	29.93	119	37.88	144	45.84
20	6.39	45	14.33	70	22.29	95	30.24	120	38.20	145	46.16
21	6.71	46	14.65	71	22.61	96	30.56	121	38.52	146	46.48
22	7.03	47	14.97	72	22.92	97	30.88	122	38.84	147	46.79
23	7.34	48	15.29	73	23.24	98	31.20	123	39.16	148	47.11
24	7.66	49	15.61	74	23.56	99	31.52	124	39.47	149	47.43
25	7.98	50	15.93	75	23.88	100	31.84	125	39.79	150	47.75
26	8.30	51	16.24	76	24.20	101	32.15	126	40.11	151	48.07
27	8.61	52	16.56	77	24.52	102	32.47	127	40.43	152	48.39

world's largest stainless steel centrifugal casting



. . . cast by SANDUSKY . . . melted in AJAX Furnaces

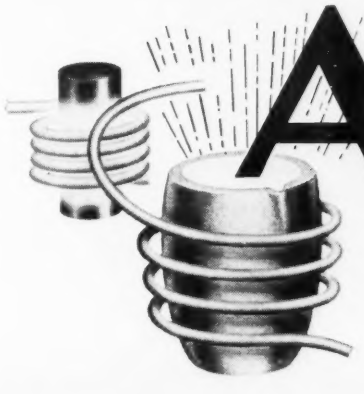


Here, at Sandusky Foundry and Machine Co., is Ajax induction melting at its best. Here . . . where furnaces of up to 5 tons capacity melt metal for centrifugal castings weighing up to 20 tons . . . Ajax Northrup induction equipment has simplified techniques, improved casting quality and permitted a cleaner, more efficient shop.

The Sandusky installation typifies a melting technology that has revolutionized foundry procedures . . . casting parts of accurate analysis faster and with less waste. Sandusky also represents extreme flexibility of induction melting. Two motor-generator sets permit complete freedom of choice when selecting melting facilities for a particular job.

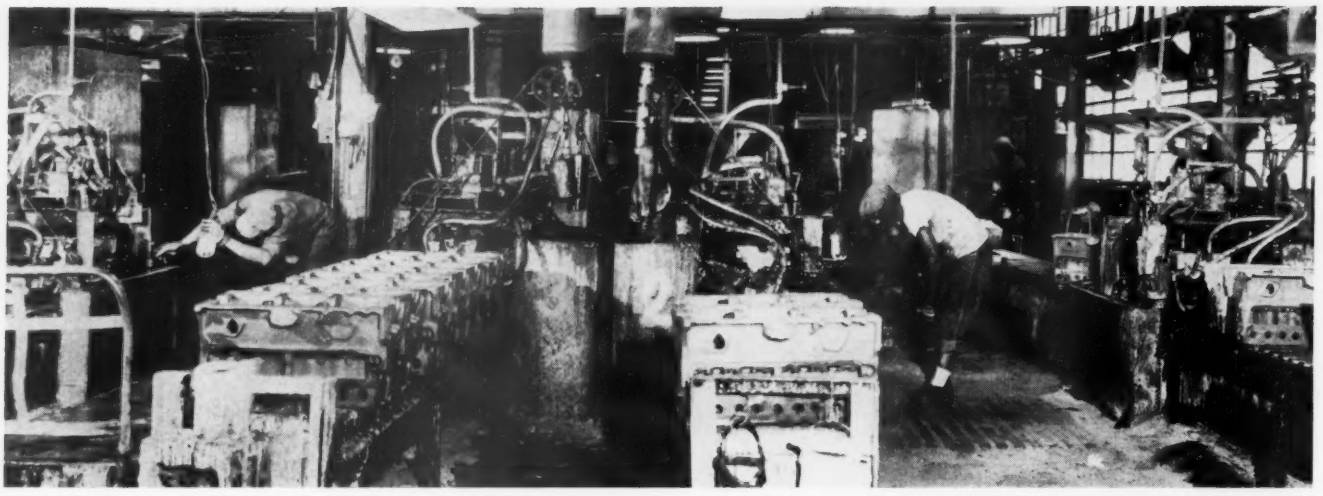
These advantages of Ajax-Northrup induction melting equipment can be realized in your foundry . . . whether ferrous, non-ferrous, or both. Write Ajax Electrothermic Corp., Trenton 5, New Jersey, for additional details in Bulletin 27-B.

Associated Companies Ajax Electric Company—Ajax Electric Furnace Co.—Ajax Engineering Corp.



AJAX NORTHRUP SINCE 1916

INDUCTION HEATING-MELTING



Four production lines in plant where 2400 six-cylinder engine block castings are impregnated with metal oxide type seal during two eight-hour shifts daily

Foundry Impregnates Entire Production

MORE than a year ago, a large midwestern foundry started impregnation of 100 per cent of its casting production with a new metal oxide type sealing material. Reported results to date are a substantial increase in percentage of sound castings produced and low maintenance costs in the absence of any downtime to date.

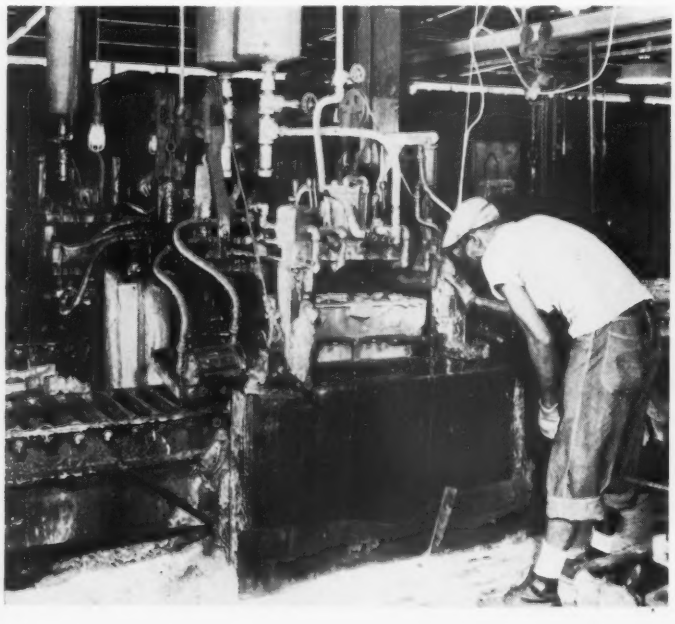
The foundry originally converted water test equipment on 6-cylinder automotive engine block lines from a sal ammoniac system to one circulating a mixture of water and the metal oxide seal. Later, a similar installation was made on an 8-cylinder block line at another plant. Cost of the operation is estimated at less than 3 cents per casting.

The Impregnation Line—The 6-cylinder block impregnation line includes three boss grinding or "barbering" stations which feed four impregnation stations. Each grinding station has one operator. The four impregnating machines are tended by two men, each man operating two machines. The total operating force per shift for the entire impregnation line is five men.

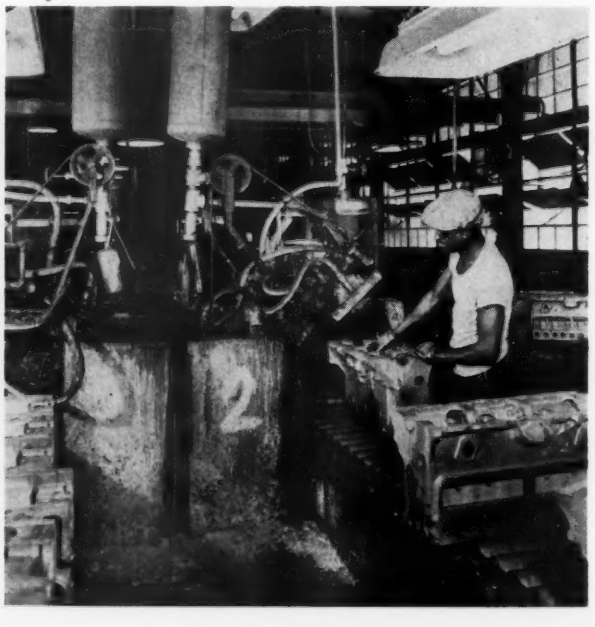
Production of impregnated 6-cylinder blocks is about 2400 per 16-hour day. About 57 gal of seal is used per day. Production of impregnated 8-cylinder blocks at the other plant is about 900 per day on one 8-hour shift, using about 28 gal of seal per day.

The Impregnation Cycle—As the casting comes from the barbering station along a roller conveyor, the impregnation operator moves it into the impregnating machine. Four air cylinders actuate sealing plates which close off all casting openings. The valve which admits the metal oxide type seal to the interior of the casting is opened and, with the seal under pressure inside the casting, a quick, careful inspection for possible leaks is made under a bright lamp. After inspection, the seal valve and air valve are closed, stopping the flow of seal and retracting the seal-

Inspecting pressurized casting for leaks. Seal in casting cavity is held at 80-90 psi for 15 seconds



Removing casting from impregnating machines. Complete cycle for process takes less than 35 seconds



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ing plates to permit removal of the casting from the machine.

The entire cycle from the time the impregnation operator begins to move the casting into the machine until he removes the impregnated casting requires less than 35 seconds. Less than 15 seconds of this time is required for actual impregnation—that is, for opening the seal valve, inspecting the casting and closing the seal valve. No additional immersions or baking operations are required. In spite of the short cycle time, sealing is complete because the seal is achieved instantaneously.

Impregnation of the casting prior to machining generally is recommended because the rough casting is dry and free from oil and therefore easier to wet. This condition permits the solution to make a deeper penetration for a better, more effective seal.

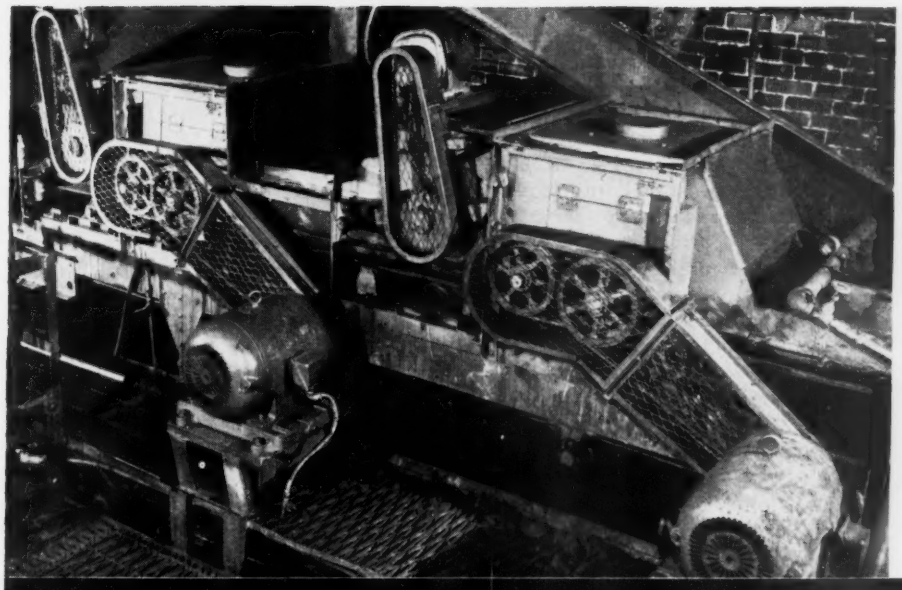
How the Seal Works—The sealing material used in this foundry is a metal oxide type produced by Prenco Products Inc., 507 E. 10 Mile Rd., Hazel Park, Mich. Relatively new in the field of casting impregnation materials, this type of seal consists basically of minerals and metal oxides suspended in a sodium silicate vehicle. It also contains a special catalytic oxidizing agent and a rust inhibitor.

During the less than 15 seconds that the seal occupies the casting cavity (at 80 to 90-psi pressure and 180° F minimum temperature), it seals the casting; flushes out core sand and other foreign substances; and provides the casting with internal rust protection.

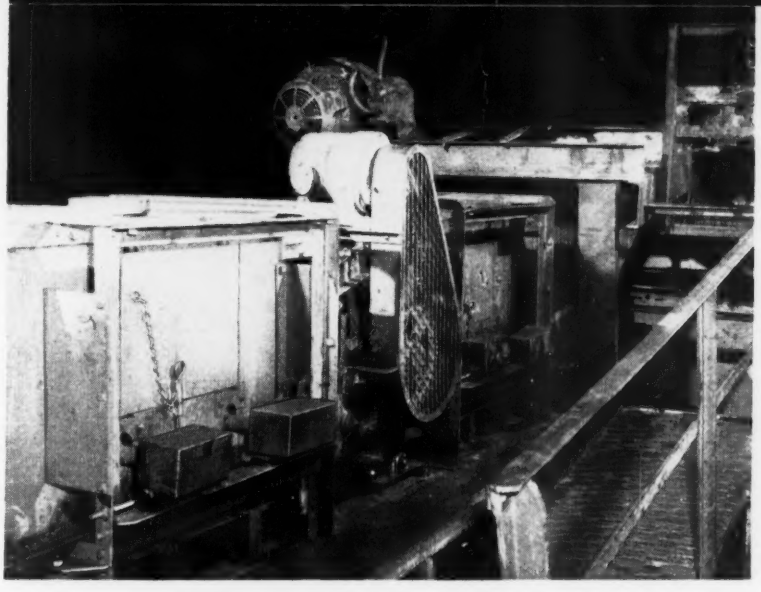
Sealing the casting precludes the possibility of a fine leaker developing. Flushing the casting permits elimination of the normal caustic wash operation. With internal rust protection added, the castings need not be covered during storage.

The metal oxide type seal enters the casting cavity and penetrates the microscopic pores which exist in all surfaces exposed to it. Once inside the pores, the catalyst in the seal prompts an instantaneous chemical reaction which forms a metal-to-metal bond between the metal oxides in the seal and the metal of the casting. This bond grows stronger with time. The rust-inhibiting surface coating is applied to the casting interior simultaneously.

Equipment Required—Conversion of water test equipment to this type impregnation requires minor changes in valving and the addition of a simple system for pumping the seal and holding its temperature at more than 180° F. The 80 to 90-psi pressure required for impregnation means that a pumping unit must be provided as



1 PEKAY MIXER-MULLER installation conditions 125 TONS per hour of molding sand



THIS SINGLE INSTALLATION (at International Harvester's FARMALL WORKS, Rock Island, Illinois) comprises (top) one 2 cutter-2-Muller unit on a 30" belt, and (bottom) another 2 cutter-1-Muller unit on a 24" belt. Sand feeds from the 30" to the 24" at right angles. Removable side plates make inspection and maintenance simple, fast. Any number or combinations of units can be quickly installed, directly on the existing conveyor system, to handle any desired volume of sand.

Up to 125 tons per hour of well-fluffed, lump-free, free-flowing sand . . that's what you get with a PEKAY Mixer-Muller installation like this one. And it's consistently *better-conditioned sand,* coming through at lower temperatures.

What's more, this PEKAY installation was made directly on the distributing belt; no special feed or discharge belt systems were needed. You can see what that meant in time saving—and money saving. And another big PEKAY advantage is that moisture and bond additions are made *automatically,* with the PEKAY Sand and Water Proportioner which prevents slurry feeding if the sand storage bin is empty.

A long and growing list of well-known foundries, large and small, have found that installing PEKAY Sand Conditioning Equipment is a mighty fine investment—and usually a *smaller* investment than you'd have to make for many less modern machines. PEKAY equipment is designed and built to boost production speeds, to improve sand quality, and to combine sturdiness and simplicity for longer life and for easier, less frequent maintenance—all for a lower first cost and with less time and trouble for installation.

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part of the supply system.

In the installation described, a 1300-gal reservoir is used to supply seal to the four impregnation machines. The reservoir is located in a small building attached to the plant proper, but outside of it. It is situated in the general storage area and is quickly and easily serviced by maintenance personnel.

Reservoir content is checked every hour and recorded. The check includes a sedimentation test (ratio of solids to water) and a specific gravity test (ratio of sodium silicate to water). Since the solids do the sealing, too low a content of solids may result in incomplete sealing. Too high a content may result in poor economy of impregnation. If specific gravity is too high, the resultant high viscosity minimizes the effectiveness of the seal in penetrating the microscopically porous areas in the casting.

National Bureau of Standards Handbook Covers X-Ray Safety

National Bureau of Standards handbook 60, *X-Ray Protection,* recommends standards of safety set forth by the National Committee on Radiation Protection. It supersedes NBS handbook 41, *Medical X-Ray Protection up to Two Million Volts,* prepared by the committee in 1949.

General rules are given for working conditions, survey and inspection of installations, planning an x-ray installation, structural details of protective barriers, maximum permissible weekly radiation dose and changes in x-ray equipment design. Additional rules are given for specific applications.

The handbook consists of 41 pages, including nine line cuts and 14 tables. Copies may be ordered for 20 cents each from the Government Printing Office, Washington 25, D. C.

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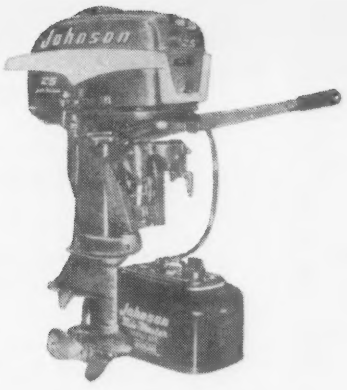

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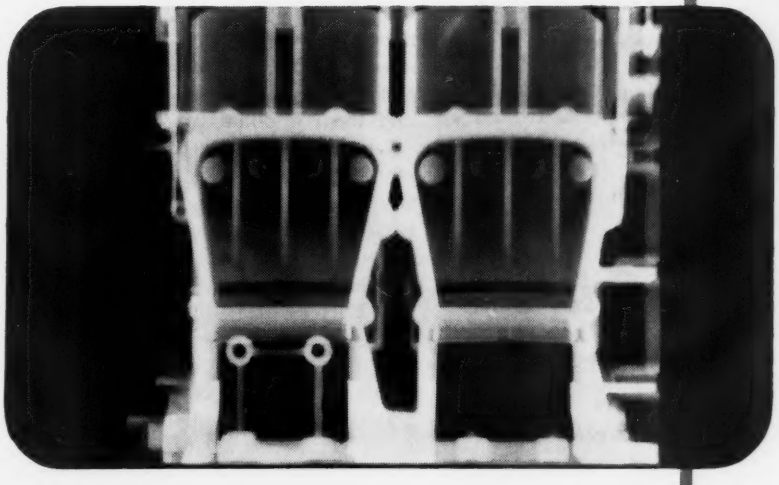

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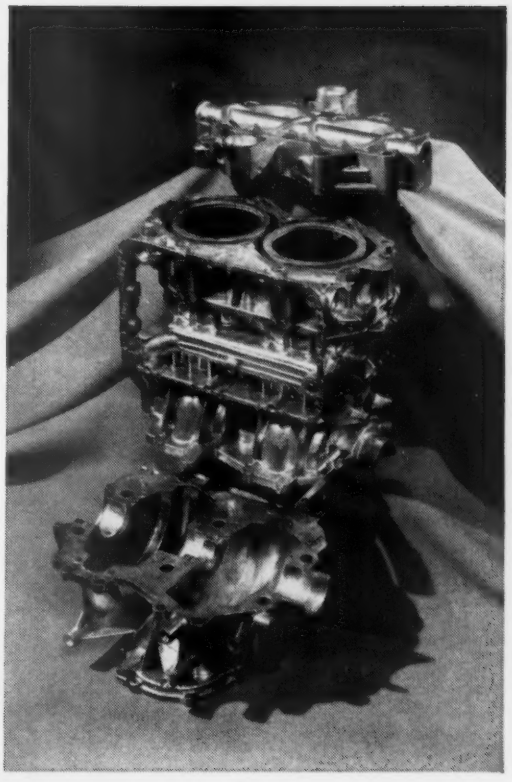

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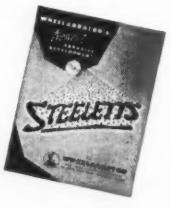

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Occupational Burns in The Metals' Industry

Their Treatment Has Been Improved by New Methods

By Dr. W. Schweisheimer

A REMARKABLE case of occupational burns had a happy ending recently in Denver.

A steelworker, Benny Fernandez, received second and third degree burns of the neck and face after a ladle of molten iron blew up in his face. The temperature of the molten iron was 2700° F.

Thanks to his safety glasses, his eyes were unharmed. Thanks to his rugged constitution, he quickly recovered from the extremely severe burns. "Ben is a steelworker and hard rock", said his doctor. "He never went into shock and never needed anything else but bed rest and local applications."

Dr. J. T. Barwick, of the medical staff of the Colorado Fuel & Iron Corp., was kind enough to give a report on the treatment of this case. The portion of the neck which was burned was mostly third degree. Mr. Fernandez was treated by thorough cleansing with soap and water, followed by the application of a solution made up as follows: Compound tincture benzoin 8 oz, iodoform powder 5 grams.

The medical staff of the corporation has routinely used this treatment for burns for the past two years. By doing so it has eliminated the necessity for changing dressings daily, and prevented considerable infection, the natural consequence of any burn.

The compound tincture of benzoin is an alcoholic solution of a balsamic resin. When this solution dries, it leaves a coating over the burn which protects it from the air and thus relieves the pain to a great extent.

Sources of Burns—The most frequent sources of occupational burns and scalds are, according to a study by Drs. L. Schwartz, Tulipan and Peck, foremost experts on occupational diseases of the skin: 1) Solid bodies—heated metals, molten resins, rosins, pitch and other substances which solidify at once on contact with the skin. 2) Liquids, such as hot water and heated fats and oils, which spread over the surface of the skin to a greater or less extent according to their density. 3) Gases such as steam and hot air. 4) Flames from ignited materials such as wood, coal, petroleum, alcohol and

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gas; flames from welding torches; explosive mixtures of inflammable gases. In explosion or ignition, temperatures may reach extremely high levels and rapidly produce grave injuries.

Some special burns in the metal industry, as mentioned by Schwartz and Tulipan, are due to welding by blowpipe. They usually appear as lesions on the backs of the hands or the fingers. Employees of foundries and metal works may be hurt by slag and splashings of liquid metals. Putting material into hot furnaces has caused severe burns, but the introduction of mechanical processes is largely reducing the risk from this source.

There are still hazards of burns in processes such as tapping or pouring of molten metal. Burns on the top of the foot from droppings of molten metal are typical, 40 per cent of the burns in metal works occurring in these various processes. Flying particles of hot metal may cause burns to the eyes.

A young man was filling a tractor's gasoline tank when it became ignited by a cigarette. The gasoline splashed on him, setting his clothing ablaze. Medical experience shows that those who are burned over more than 50 per cent of the body, usually do not survive. This man was burned severely over 71 per cent of his body.

Recognizing the apparent hopelessness of the case, Dr. James Whitelaw in Phoenix, Ariz., gave him ACTH, the hormone of the pituitary gland that stimulates the adrenal gland to manufacture cortisone which had such excellent results in the treatment of arthritis. Immediately pain and shock disappeared. The burns began to heal. Skin grafts quickly took over the sites of the burns, and new skin grew like magic. Dr. H. A. Rusk who reported this case, stated that a number of other burns have been treated since in the same way, also with good results.

First Aid for Burns—If a shock has been combined with the burn, the best treatment is to keep the patient warm (not hot), give him sweet drinks and reassure him of quick recovery. The use of narcotics will depend upon the presence of a doctor.

Experts recommend that for first measure, while the wound is still dry, the burn should be covered with ointment and light bandages of gauze. Don't touch the wound or the gauze which will cover the burn!

Surgeons clean the surrounding

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skin with soap and water and use compresses for one to two days, followed by sterile dry dressings. Cleansing eliminates bacteria on burnt surface and skin. But intelligent first aid does not use such cleaning methods—all it does is prevent further harm by protecting the wound with clean gauze or, in an emergency, clean linen.

A great improvement in treatment of extensive burns is the closed dressing principle, first proposed by Drs. Siler and Reid and generally adopted after its merit was proved in the Boston Cocoanut Grove disaster in 1942. The closed dressing, infrequently changed, allows healing of almost all superficial burns, mild or deep, in 7 to 28 days. Possible infection will be prevented or combatted by preventive doses of penicillin.

Dressings for burns are planned not as a mere cover, but for two special reasons. The first is to reduce the risk of infection so far as is possible. The second reason is to reduce the oozing from the burn. For the same reason the compresses are under light pressure, the bandaging applied firm but not tight.

Three Degrees of Burns—Burns usually are classified in three degrees.

A first-degree burn may cover a large area of reddened and unbroken skin. A second-degree burn is similar to a condition due to a scald. Here the skin is blistered and broken. In a third-degree burn the tissue is burned away to a certain depth.

A bland or anesthetic ointment helps to relieve pain. Quite a few substances have been recommended as protective coating over the burn. Satisfactory results have been obtained with castor oil, tannic spray, petroleum jelly, tannic jelly, gentian violet solution, or a 2 per cent solution of brilliant green. Second and third degree burns need the assistance of a doctor.

In cases of burns the intake of fluids and salt solutions is helpful. Water, tea, coffee, carbonated beverages, etc. should be offered regularly to the injured, provided they are conscious.

A flash burn is the most frequent eye emergency in the welding industry; it is connected with the ultraviolet rays of the welding arc. An anesthetic eye ointment in the eye every two hours will give relief. Instillation of epinephrine and homatropine hydrochloride is also recommended. According to a report by Dr. A. A. Knapp, there were many flash burns of the eye at the New York Navy Yard during the last war, all of which were treated in this fashion with quick and complete cure. For additional relief he prescribes iced boric compresses, 15 minutes four times a day.

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Other topics under study will include reactions in iron and steelmaking, furnaces and refractories, basic physical chemistry and practical problems. Tuition for the course is $200, and the MIT dormitory system will be available to all registrants, including married couples and single women. Further information is available from the Summer Session Office of MIT.

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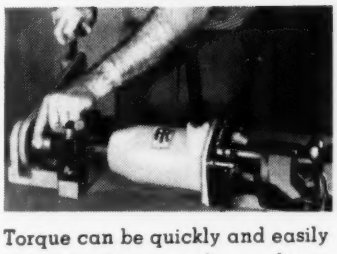

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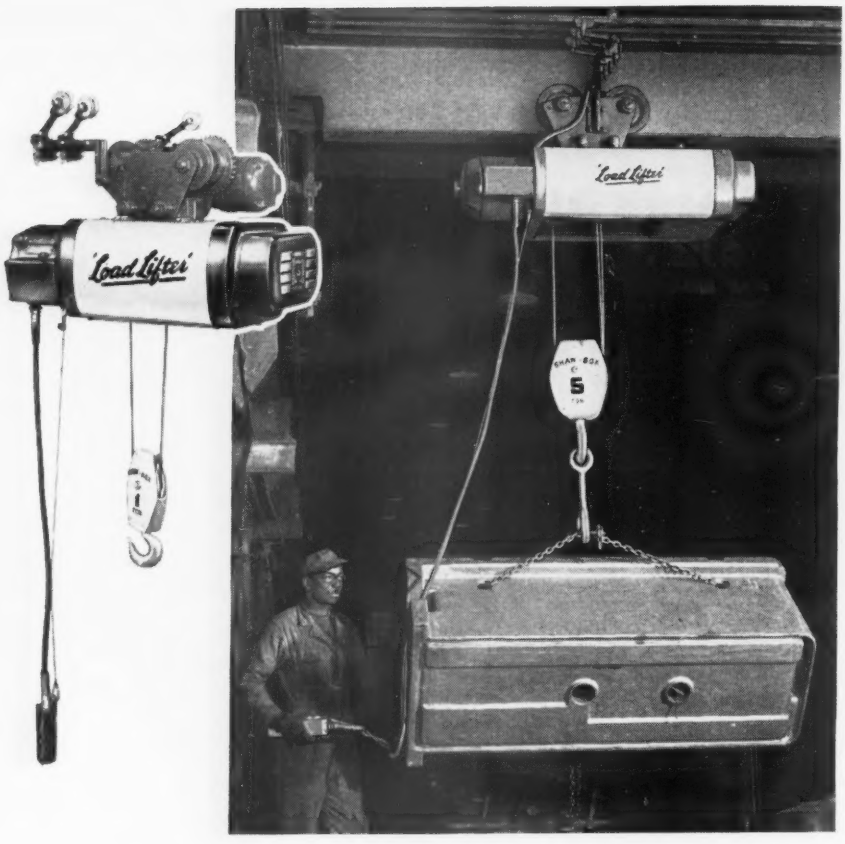

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Job Evaluation Increases Efficiency of Employees

Equitable Wage Rates Can Be Established

By Robley D. Stevens

THE problem of meeting wage demands and determining what constitutes a fair and equitable rate for a given job perplexes many employers. In any industry, harmonious relations with employees have a direct bearing upon the cost of doing business, often making the difference between profit and loss.

Job evaluation provides a workable tool for appraising employee performance. A systematic job evaluation plan provides management with the information it needs to get the best work performance from every employee.

Any job evaluation plan is, of course, not a substitute for intelligent and enlightened personnel relations. But in the one area of evaluating personnel, the same scientific principles and objectivity used in technical management can be applied.

Dissatisfaction over pay rates does more to impair employee efficiency, encourage absenteeism and increase labor turnover than any other single factor. Ask yourself these questions: How does your management allot job rates? How does it solve wage demands? Are there inequities in pay among employees working on the same job? How do your rates compare with the general level in industry and with those of competitors?

Job Analysis Is First Step—The job classification plan is essentially an inventory of the duties and responsibilities of employees. For accurate, objective answers to the above questions, there is no substitute for a sound job evaluation plan based on a thorough analysis of every job. Such a plan eliminates the hazards of arbitrary personal opinions and habit in the determination of wage rates. It defines the duties and responsibilities of each job, regardless of the person who does it, and sets up basic and consistent policies for compensation.

The initial step in any job evaluation plan is to obtain, analyze, record and study all factors involved in a given job. This step means collecting complete, accurate and intelligible descriptions.

Contrary to popular belief, one

need not necessarily engage outside counsel to install such a system. All that is really essential is reasonable intelligence, objectivity and a willingness to do the work.

To be useful for job evaluation, a job analysis should include a detailed breakdown of every job in the total plan. Such an analysis should provide management with an organized picture of the abilities which, on the basis of careful job study, appear to be significant in job competence. Collection of the necessary data in a systematic way not only reduces effort, but also is helpful in insuring adequate coverage and weighing of all aspects of the job.

In making a job analysis for job evaluation purposes, the technician (foreman in this instance) should interview inferior as well as superior workers. Both can help to provide a picture of typical job duties and the kinds of information needed to perform the duties adequately.

Critical areas of knowledge also can be identified by observing the characteristic differences in job performance between two or three of the most competent workers and two or three of the least efficient. The worksheet might include data on these points: Job duties, essential knowledge, specific information and typical inadequacies of the job and worker.

Some companies may find it desirable to maintain a dual filing system on job analysis, one set of cards for regular use in assembling the information and one set as a permanent file to facilitate location of any particular job item, whether active or inactive, on which total information is needed.

Once the questionnaire for job description is ready for use, the average employee can fill it out under proper supervision. Such participation will help to sell the job evaluation plan to workers, who will feel greater confidence in themselves and in management by getting a clearer grasp of their functions and duties.

Various Systems—Job evaluation is not new. The first scientific plan for the study of jobs and wage relationships was advanced in 1881 by Frederick W. Taylor, who made time studies and analyzed jobs into units and duties. The analysis consisted largely of a sequential listing of the steps needed for production and the time necessary for each step, so as to accumulate a standard time for the production of a single unit. The establishment of wages by analysis

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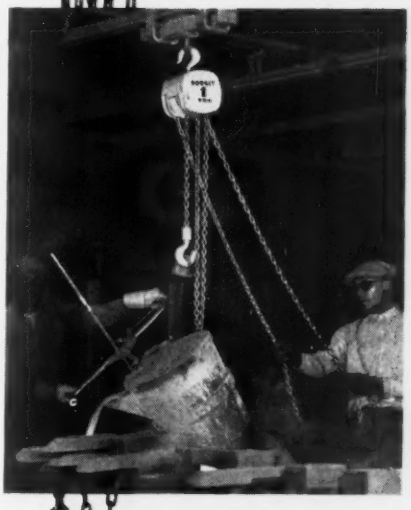

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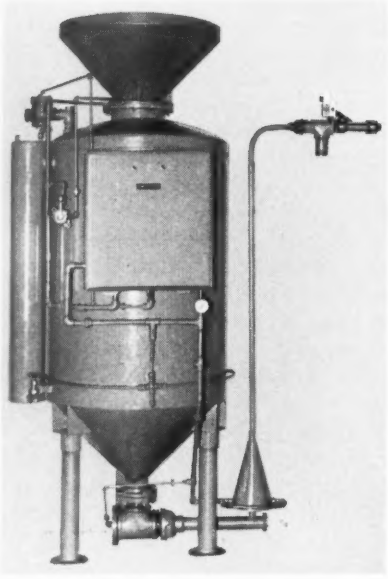

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has been found in practice to be a very definite step forward in solving wage demands.

Here are the four basic job evaluation systems now in use:

1. *Ranking System*—This method sometimes is refered to as the card-sorting system because the jobs are arranged from high to low, like a deck of playing cards. All jobs are ranked in order of importance—that is, in terms of other jobs, not in terms of money, and without reference to the personality holding down the job. The best method usually is to list all the jobs in every department on a separate sheet, horizontally, and to have department heads arrange them vertically, in order of importance. The individual department lists then are combined into one organizational chart. With this type of ranking, it is essential to check and double-check with the various department heads to avoid disagreement.

2. *Job Classification System*—Under this system, a number of categories or grades are established in advance, and jobs are assigned to these classifications. Such a method presupposes that every job contains definite elements or phases that can be classified into grades. Grades then are established on the basis of difficulty and responsibility, as represented by the number and kinds of rules regulating the work done and by whether or not and how often the work is subject to check. The success of such a job measuring stick depends on a thorough knowledge of all the jobs. Every work element must be taken into consideration and the duties and responsibilities of every worker clearly distinguished.

3. *Point System*—This method is the simplest and most widely used. Moreover, it rapidly is gaining still greater acceptance by American industry. Briefly, it works like this: A number of predetermined factors, such as age, education, years of training, experience needed, physical effort involved, etc., are found to be common to all jobs. A schedule of points then is set up for the various gradations of each factor. Each level must be strictly defined so that consistent interpretations of the elements included in each factor may be made.

The levels or grades of each factor should be expressed or defined in written form, and it also is desirable to have such definitions accompanied by examples of standard or well-defined jobs that have taken into consideration the following: The

minimum ability an employee brings to the job; the extent to which he is called upon to use them; the responsibilities which the employer demands on the job, and the conditions under which the job must be performed. When the individual jobs have been evaluated, the sum of the job factors should be well under the maximum total points of the system.

4. *Factor Comparison System*— There are several differences between this method and the point system. One is that the graded factors are assumed to be fundamental to all jobs. Another is that jobs are evaluated relatively, using certain existing jobs as points or degrees on the evaluation scale. This system has the advantages of simplicity and of establishing a fixed relationship between job value and actual compensation since it is based on key jobs for which compensation is standard or, at any rate, not subject to controversy.

Once the key jobs have been selected, they are ranked from highest to lowest in order of importance. After the ranking, however, the key jobs are evaluated by study and examination of individual job descriptions. All other jobs then are related to the key jobs, and the final result is an agreed-upon, company-wide grading system.

The important thing to remember in any job evaluation plan is that it must not become mechanical, but should be checked periodically to determine how effectively it is being administered. The one good criterion of job evaluation is that its continued acceptance be recognized by management and labor.

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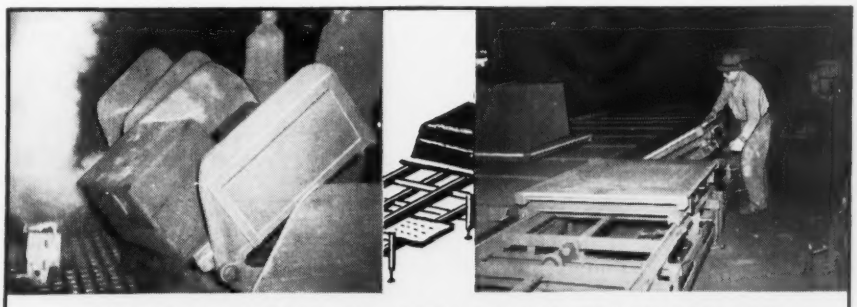
Appoints Sales Representative

Dracco Corp., Cleveland, has appointed Horrell Co., 8240 Beverly Blvd., Los Angeles, to be Southern California sales representative for its dust collectors and conveyors.



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The Shakeout

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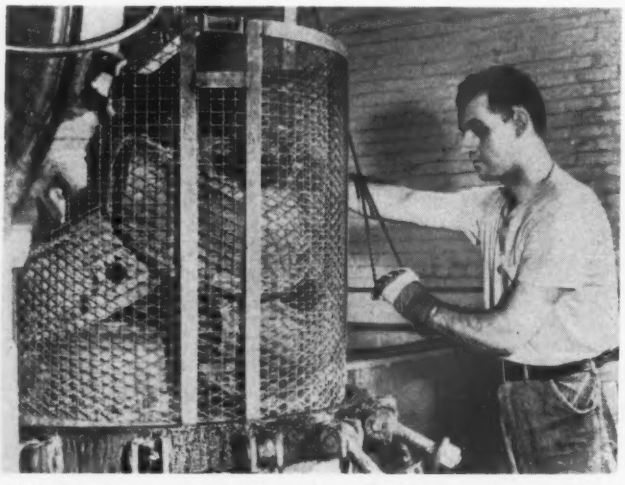
AIRCRAFT ENGINE castings now are sealed against porosity with a 20-per-cent saving in production cost and a 40-per-cent reduction in cycle time at Lycoming Division, Avco Mfg. Corp., Stratford, Conn. Developed by Bakelite Co., a division of Union Carbide & Carbon Corp., New York, the sealant is compounded and supplied by Impco Inc., Cranston, R. I., to seal castings of cast iron, magnesium, copper and aluminum alloys.

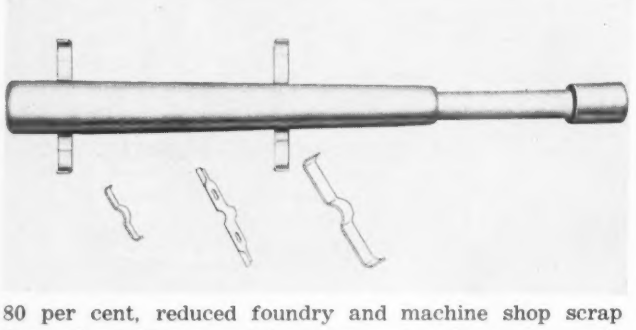


The castings are sealed in less than 5 hours with one cycle. Porous castings of a crankcase front section, for example, may be placed in a pressure vessel and impregnated with the sealant. A vacuum first is drawn to remove all air from the pores. Air pressure then is applied to impregnate the casting thoroughly, as shown here. Castings next are rinsed with warm water and a mild detergent to remove any excess of the self-emulsifying resin, and cleaned castings are placed in a tank of hot oil at 270° F to cure the resin. The polyester sealant gels quickly and forms a hard solid in 60 to 90 minutes. Each casting finally is tested for leakage under water at 180-200° F at pressure to 70 psi.

For More Details Circle No. 105—Page 187

Chaplets Reduce Cost of Castings

LONG, THIN CORES can be made in segments with chaplets made by Snyder Chaplets, Davenport, Iowa. Used by a midwestern foundry in corn-picker snapping roll casting cores, where uniform wall thickness was required, these parts cut chaplet cost per casting over



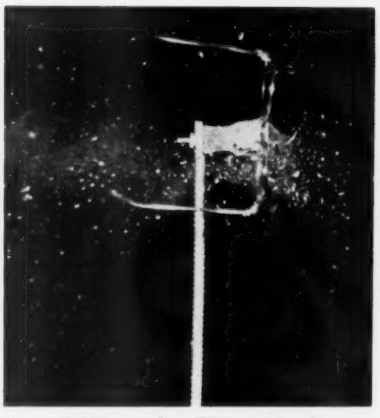
80 per cent, reduced foundry and machine shop scrap from about 30 per cent to 4 per cent and saved an estimated $1 per casting—a saving of $250,000 in 7½ years.

When cores are made in segments, long, difficult-to-blow coreboxes are eliminated. Shorter boxes with two or more cavities are used. In addition, core rise during pouring of castings assertedly is avoided. Cores can be set easily. Chaplets are inserted in the corebox before the core is made and become an integral part of it.

For More Details Circle No. 106—Page 187

Hard Resin Lenses Survive Shotgun Test

HARD RESIN LENSES are said to be 30 times more scratch resistant than other plastics and impervious to all common chemicals, including such solvents as acetone. They reportedly are clearer than fine glass and do not discolor with age. Steaming up is reduced substantially, and the weight is less than half that of glass.

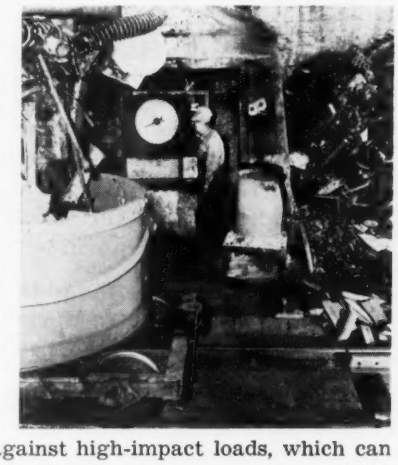


The illustration shown here was taken during a test in which rounds were fired with a 16-gage shotgun at pairs of spectacles in which one lens was conventional glass and the other the new hard resin. In these tests, the glass was blown out each time, at 35, 40, 45 and 50 yards. The resin lenses cracked but did not shatter at 35 and 40 yards, and they were undamaged at 45 and 50 yards. These lenses are made by Armorlite Lens Co., Pasadena, Calif.

For More Details Circle No. 107—Page 187

Scrap Metal Is Weighed Electrically

SCRAP METAL for the cupolas is weighed electrically in hopper cars at the Radford, Va., plant of Lynchburg Foundry Co., Lynchburg, Va. The weighing system is comprised of four SR-4 load cells under the corners of the weigh bridge and a combination dial indicator and digital printer which automatically totals weights on all four cells. Cells and electrical instruments are products of Baldwin-Lima-Hamilton Corp., Philadelphia. The weigh bridge has no moving parts, and the load cells are impervious to dirt and moisture, which would create problems.



A feature of the scale is a provision against high-impact loads, which can occur if a piece of scrap is dropped on a corner of the scale. Protection is provided by cushioning overloads on springs preloaded enough to prevent compression until there is an overload.

For More Details Circle No. 108—Page 187

SILICAMIX . . . a new, superior, gun-shot CUPOLA PATCH

BUCKEYE SILICAMIX is a new development that provides a superior gun-shot mix for patching gray iron cupolas. Its uses provide the same qualities and results from this gun-shot material that have been so popular with the well known Buckeye Silica Firestone. Buckeye Silicamix is actually small pellets of this firestone, coated with clay—a special refractory fire clay. When applied under pressure with water, Buckeye Silicamix sticks tighter to the cupola walls, keeping costly "drop" to a minimum.

Try SILICAMIX on your next cupola lining job . . . . . .

A Buckeye refractory engineer will bring you free samples for inspection and trial. See for yourself how its faster "buckshot" action adds up to more economical cupola operation.

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BOKOE No. 3 Universal Miller

For non-ferrous, cast iron and alloy steel tooling, patterns and production to close tolerances.

Use it for radial drilling in addition to vertical milling, universal milling and boring up to 11⅞".

- Column swivels 180° in either direction
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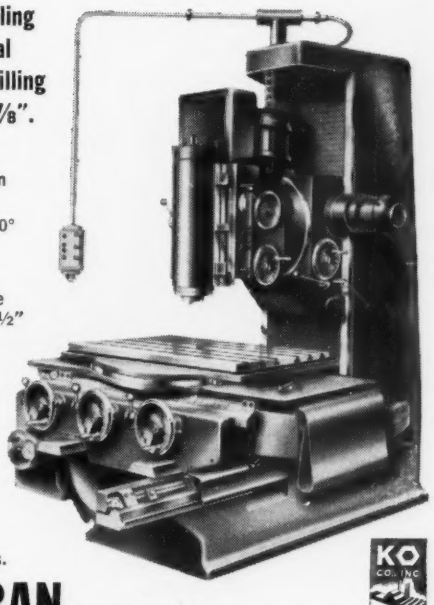

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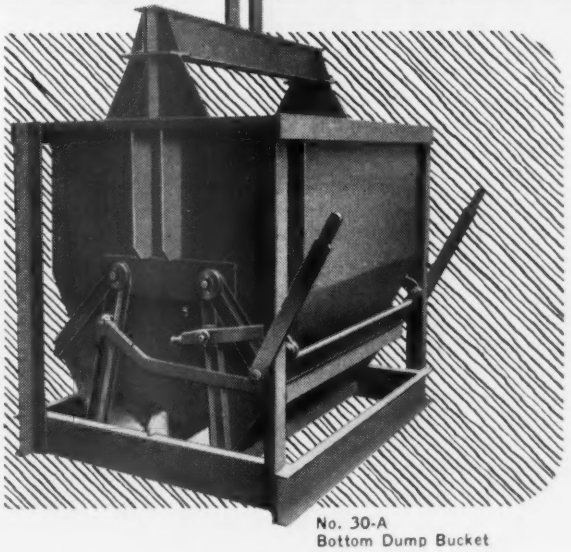
PENN BUCKETS



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Exclusive design makes this bottom dump bucket easy to operate . . . easy to open. Efficient for foundry use in handling all types of sand, moulding or core, dry or prepared. Can be used with coke, scrap iron and castings also. Sizes 7 to 200 cu. ft.

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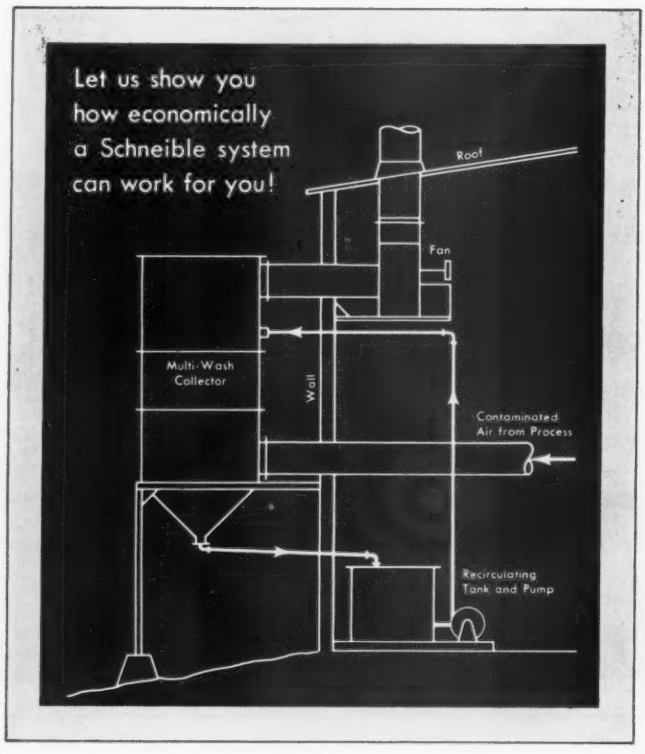

Wherever you see a Schneible Dust Control System you'll find an efficient, profitable operation.

Whether it be Cupola Collectors, Hoods for pouring, shakeout, casting cooling, grinding, tumbling or Multi-Wash Collectors in operation on one of its many diversified uses, you can be sure that economy and efficiency was a determining factor in the choice of Schneible Dust Control Equipment.

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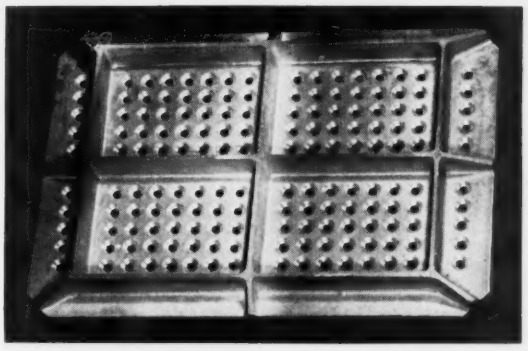
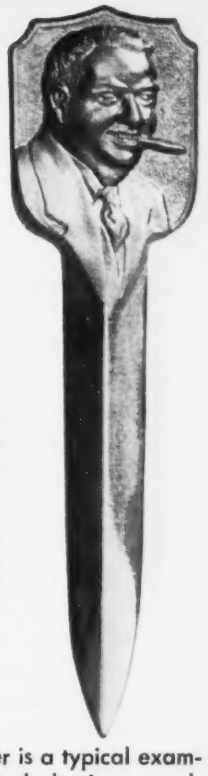


"CUSTOMCAST" Aluminum BOTTOM BOARDS

Standard or Special



Reduce casting rejects and greatly curtail board losses with "CUSTOM-CAST", lightweight, rust-proof, Aluminum bottom boards . . . at prices that will amaze you.

No charge for patterns on minimum orders of 50 or more custom boards.

Non-warping and non-burning, our boards assure uniform molds every time. Stacking problems eliminated. Boards not affected by weather.

Rib reinforced for strength and rigidity, with vent holes on face to permit gas escapement.

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Write for price list of standard sized boards which may meet your needs or send a sketch with dimensions on your custom board for our quotation and early delivery date.

UPON RECEIPT OF YOUR PRINTS WE'LL ALSO BE PLEASED TO QUOTE ON YOUR CORE PLATES.

This letter opener is a typical example of a sculptured aluminum product, produced for Mr. "Cliff" Cornell; well known in the foundry trade.

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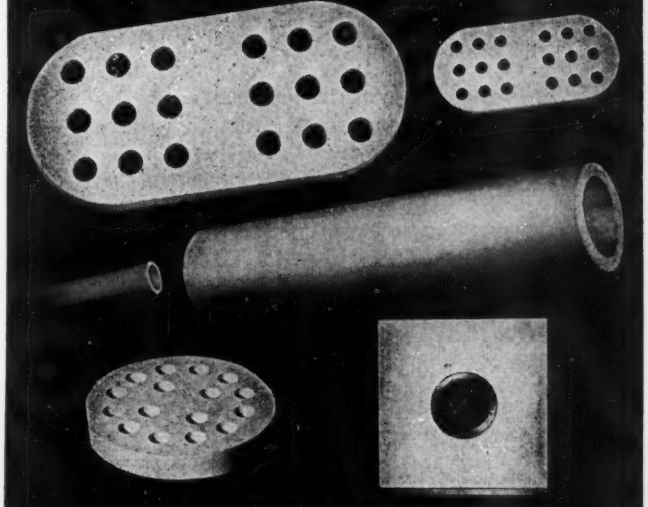

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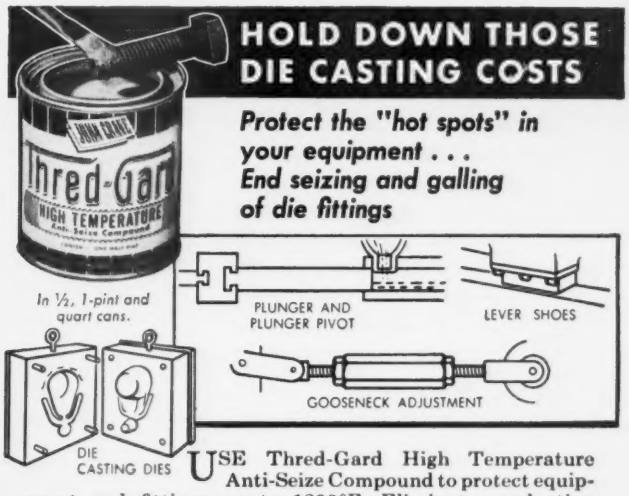
Protect the "hot spots" in your equipment . . . End seizing and galling of die fittings



USE Thred-Gard High Temperature Anti-Seize Compound to protect equipment and fittings up to 1200°F. Eliminate production losses and maintenance costs due to heat strain, seizing and galling.

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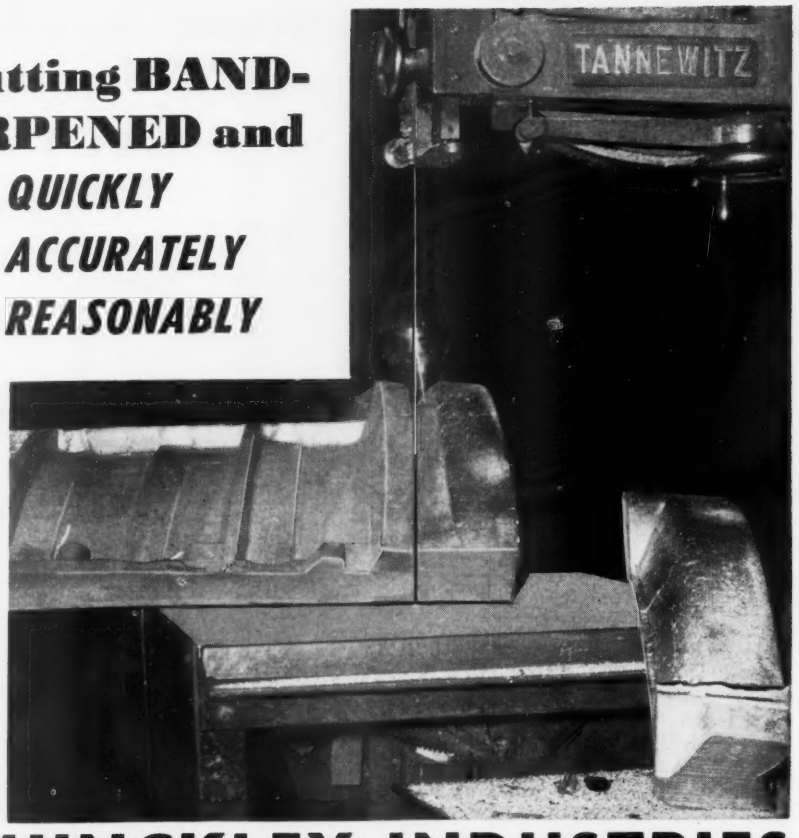

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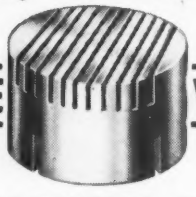

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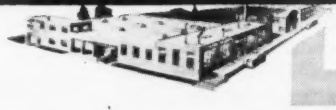

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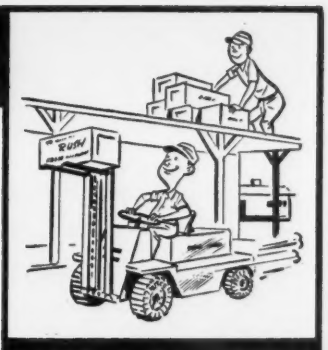

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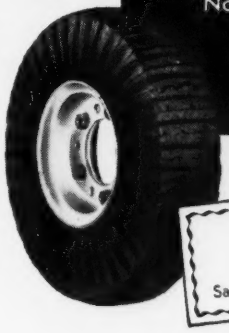

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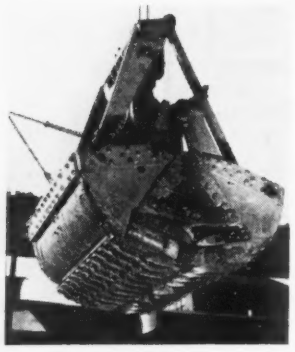
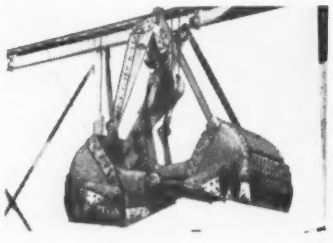


BLAW-KNOX "Shark Tooth" Single-Line Hook-On Buckets cut the cost of rehandling coke, coal, sand, and small limestone because one bucket, with easily attached or removable liner plates, is all you need. With the plates attached, fine granular materials are handled without leakage. Without the liner plates, the "shark teeth" literally finger their way through the coke, so it may be handled with minimum degradation. Hook-On feature permits quick detaching for change to magnet.

Above — Rated 1-cu. yd. closed head type Blaw-Knox "Shark-Tooth" Bucket, without liner plates, reeved 2-parts for 13'6" headroom. Range of sizes for every requirements.

Right — This open head type Blaw-Knox Bucket, rated 1-cu. yd., is equipped with liner plates for rehandling sand, coal, limestone, etc. Shown reeved 2-parts for 8'9" headroom. Choice of sizes.



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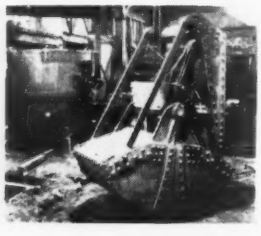
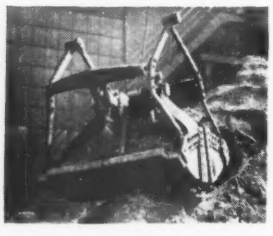
help solve average or unusual conditions





FOR AVERAGE HEADROOM— There's a type and size of Blaw-Knox Single-Line Hook-On Foundry Buckets to meet a wide range of operating conditions. Take advantage of the Blaw-Knox engineering service available without obligation to help you select the bucket best suited to your needs.

FOR LOW HEADROOM— This Blaw-Knox Single-Line Hook-On Bucket solves rehandling problems when headroom is extremely limited. The ¾-yd. capacity bucket requires only 6'7" operating headroom. Also available in larger sizes.

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A compact, easily operated, entirely integrated foundry unit thoroughly degasses both ferrous and non-ferrous molten metals in a few minutes.

Complete package unit — requires no process changes — occupies small floor space — no special foundation — easily moved — requires no special experience or training.

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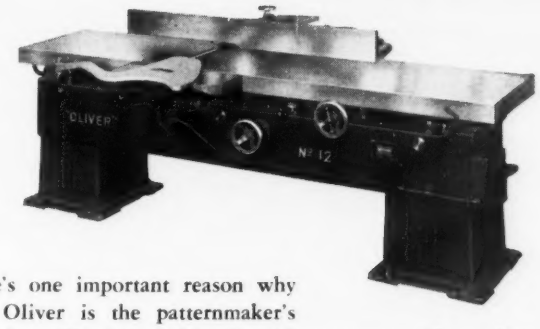
Save time! Cut perfect glue joints . . . plane draft on pattern lumber with this OLIVER



Here's one important reason why this Oliver is the patternmaker's favorite: The front table tilts sideways up to 5° to plane draft on lumber. The No. 12 Jointer makes easy work of planing long and short pieces of lumber. Tables adjustable for ¼" cut. Fence is adjustable from square to 45° across table. New rabbeting attachment. Sturdy cabinet columns eliminate vibration. Three sizes: 20, 24, 30 inches wide. Write for Bulletin No. 12.

Oliver also makes Heavy Jointers in 12" and 16" sizes, and heavy-type Jointers in 8" and 6" sizes.

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Established 1890 GRAND RAPIDS 2, MICHIGAN

For Better Aluminum AT LOWER COST

B&A POTASSIUM TITANIUM FLUORIDE
(K_2TiF_6)

Many Advantages

When making aluminum castings, the use of B&A Potassium Titanium Fluoride results in finer grain structure, with improved yield and tensile strength, greater elongation and better machinability . . . all leading to lower production costs, better products!

Low-Cost Way of Adding Titanium

The incorporation of titanium into aluminum alloys may be accomplished more economically with Potassium Titanium Fluoride than with other methods.

Adding Potassium Titanium Fluoride

Where temperatures are in the range of 1400°F, the Potassium Titanium Fluoride may be added straight or, if lower operating temperatures are employed, a mixture of this salt with Potassium Fluoborate, which has a lower melting point than straight Potassium Titanium Fluoride, may be used.

And . . . Investigate B&A Alkali Fluoborates

B&A Alkali Fluoborates are easily-handled purifying salts which the foundryman can use like precision tools for a wide range of purposes when casting magnesium, or when refining, melting or heat-treating aluminum.

For information on these high purity chemicals, call or write any of the Baker & Adamson offices listed below.

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TAM* ZIRCONITE* FOUNDRY PRODUCTS

Give you the most for your money!

The finer grain of Zirconite* products offers cost-saving advantages in steel, iron, bronze, aluminum or magnesium foundry operations.

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Does not fuse with molten metal. Resists metal wetting. Prevents metal penetration. Produces smooth casting surfaces.

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Used as a filler in cores. Lowers permeability. Increases refractoriness.

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Eliminates the problems of burning-in and penetration. An excellent means of chilling heavy sections to promote directional solidification and to eliminate heavy risers.

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Up-to-the-minute guide for costing in both small and large foundries. Prepared by practical foundrymen, based on 10 years of research and experience of the industry under Government Pricing Regulations.

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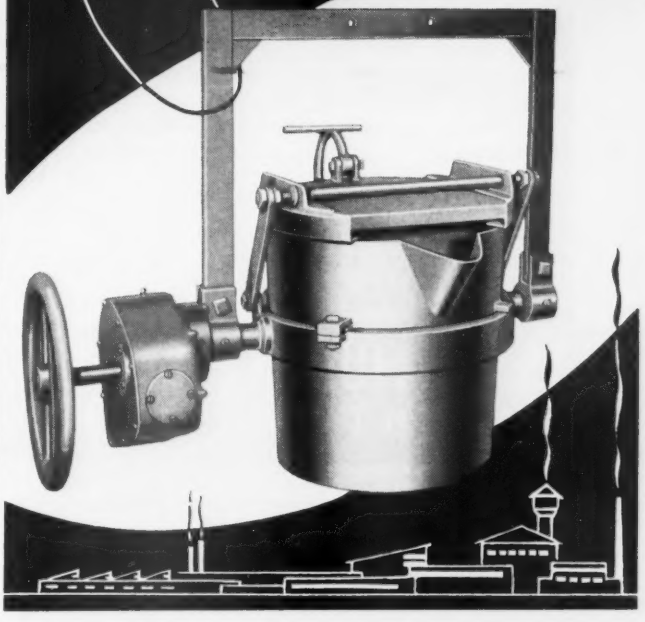
JOB ENGINEERED by Industrial

YOU SEE THE DIFFERENCE WHEN YOU START TO POUR



All ladles look pretty much alike . . . but your crews can *see* and *feel* the Job Engineered advantages of Industrial ladles as soon as they start to pour.

Industrial Job Engineered ladles handle smoothly and easily through the entire pouring routine—tipping, making the pour, straightening and moving on to the next mold. Industrial's special gearing assures precise ladle control at all times . . . and eliminates binding as a result of heat distortion of ladle bowl. One man can easily handle the entire pouring operation. That's why Industrial ladles pay off in lower costs, more efficient operation every time your crews pour a casting.

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NOW! POSITIVE MOISTURE REMOVAL
FROM COMPRESSED AIR LINES WITH THE
MURPHY AFTERCOOLER SYSTEM

The Murphy AfterCooler System guarantees the elimination of water in all compressed air line installations. Installation is simple and unit requires a minimum of maintenance. For cool, clean, dry air . . . for eliminating "down time" in compressed air operated tools and equipment . . . install a Murphy AfterCooler System in your plant now!

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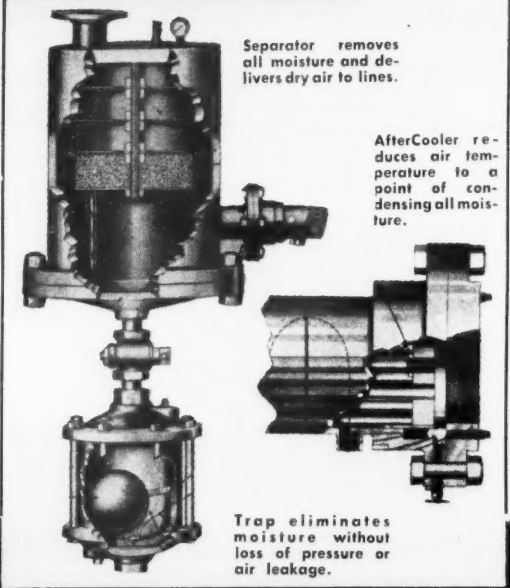
GUARANTEED COMPRESSED AIR PRODUCTS
AFTERCOOLERS • SEPARATORS • STRAINERS
TRAPS • SPRAY GUNS • PISTOL SPRAYERS



Separator removes all moisture and delivers dry air to lines.

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Trap eliminates moisture without loss of pressure or air leakage.

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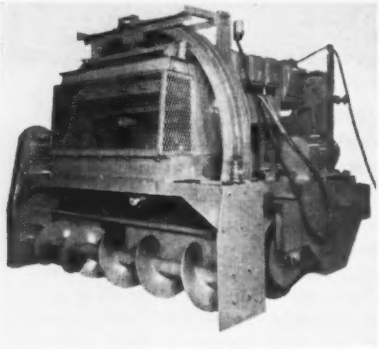

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Mixes, adds water, lifts all sand from floor, screens, magnetically separates, aerates. Cools hot sand. Cuts swath to 104", turns in 63" radius, Straddles 24" high x 70" windrows. Capacity to one ton per minute. Three foundry-proved sizes.

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Write or call for price schedule and list.

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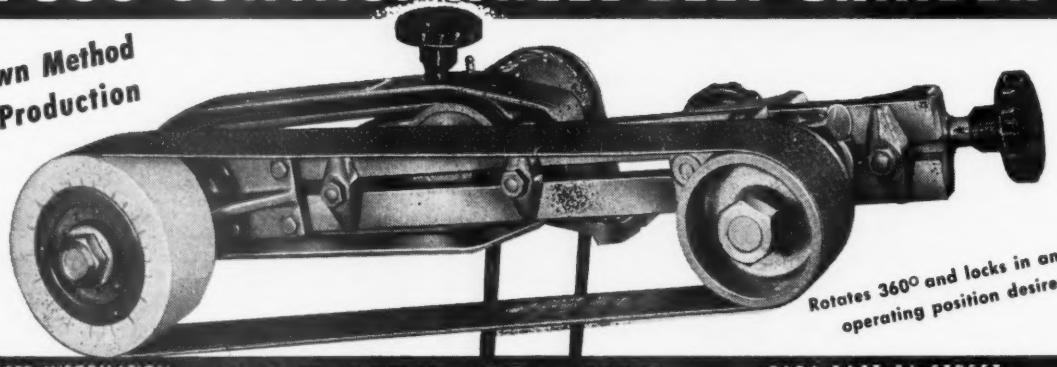

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Help Wanted

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Age 32 to 50, graduate Engineer, must have extensive experience in low carbon and stainless steel and capable of directing melter. Knowledge of sand control, gating, risering, molding, core making and general foundry operations helpful. Preference given to man with executive leanings and opportunity of becoming Assistant Manager or Manager. A wonderful opportunity for a live wire who is capable and willing to give freely of his utmost.

Location Massachusetts, job shop, 1 to 20,000 lb. castings, iron, bronze, alloy steel, 130 men. In reply enclose photograph and full particulars including approximate salary required. Your record must be as clean as a hound's tooth. We want a good man in the fullest sense of the word.

BOX 948, FOUNDRY
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GENERAL FOREMAN

To assume full responsibility for all phases of foundry operation in a captive nonferrous foundry, producing pressure castings in bronze and monel. Administrative ability of prime importance. Plant located in Massachusetts. Forward full resume including salary requirements.

BOX 931, FOUNDRY
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SALES MANAGER

Familiar with stainless steel and high temperature alloys. Technical background preferred. Location western Michigan.

GEORGE & DIX
Management Consultants
FEDERAL SQUARE BUILDING
GRAND RAPIDS, MICHIGAN

WANTED

Large steel foundry organization interested in men in thirties and early forties, preferably with pattern background and wide experience in developing and checking molding and core practices. Write stating full particulars to:

BOX 919, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

DESIGNERS-DRAFTSMEN-ENGINEERS

Experienced in foundry layouts and equipment. Age 30-45. Send experience record, personal data, recent photo and references.

BOX 943, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY ASSISTANT

Foundry assistant needed by captive gray iron foundry of medium size heavy process machinery manufacturer. Young college engineer graduate preferred. Should have had some foundry experience. Is to help increase plant efficiency, planning, research and operation. Company has liberal profit sharing plan. Salary open. Location S.E. Pennsylvania. Address: Box 912, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED

A company located in the east producing carbon, low alloy and high alloy castings desires a man to take charge of quality control. Applicant should have 10 to 15 years' experience and have thorough knowledge of heading and gating, pattern requirements, and highest quality standards. He must be familiar with all productive departments, such as molding, core cleaning and melting. A fair technical training would be required. Address: Box 934, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

FOUNDRY ENGINEER

Medium size gray iron foundry in Northern Ohio needs a man for position as Plant Engineer and General Maintenance Supervisor. He will have charge of layout and installation of all new equipment and overall responsibility for the installation and operation of a preventative maintenance program. Prefer a man between 25 and 35 years of age with some foundry or industrial engineering experience. Reply with full details on past experience and salary required.

BOX 957, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

CLASSIFIED ADVERTISERS

PLEASE NOTE!

Our next issue is the special Pre-Convention issue—MAY. Copy for this issue must reach us one week earlier than usual. Deadline is April 6. Thank you for hurrying copy to us and remembering: it pays to advertise in FOUNDRY's classified!

SALES ENGINEER

Established midwestern jobbing steel foundry. Sales and estimating experience required. Write full qualifications and required salary to:

BOX 920, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY METALLURGIST

Experienced in foundry practice, heat treating, and induction furnace melting. Please send complete data with letter. Replies confidential.

BOX 932, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

HELP WANTED

General Maintenance Foreman. Mechanical or Electrical Engineering background preferred. To head maintenance department of a leading steel foundry in east. Should be well versed in present day managerial problems and abreast of all phases of foundry and plant maintenance engineering. Job challenge, excellent pay, job security, good working conditions, promising future are available for the man who qualifies. For details, write in confidence to:

BOX 924, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

METALLURGIST

For malleable iron foundry in East, to work into complete control of product from melting through annealing. Knowledge of pearlitic malleable would be helpful. Should appeal to man who wants to be his own boss. This is a small organization. Please give full particulars regarding background and salary desired in first letter. Address: Box 944, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

NONFERROUS FOUNDRY

Needs man to improve run of mine operations so that pressure tight bronze castings and aircraft quality aluminum castings are consistently and economically produced. Attractive opportunity in Northern Ohio. Address: Box 933, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

OPPORTUNITY FOR CORE ROOM FOREMAN

With thorough knowledge of core making. The man we want must be an expert on core mixes for both ferrous and nonferrous castings and be able to rig boxes for core blowers. He must be good in handling men.

There is a permanent job in our Rochester foundry for the right man. Give us all the details—your experience, references, and salary expected—in your first letter.

EMPLOYMENT MANAGER
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APPLICATION ENGINEER

National manufacturer requires a young college engineer preferably with foundry experience for test and development work in core sand and to provide technical assistance to salesmen and foundry customers. Interesting diversified work with excellent opportunity for advancement Salary commensurate with ability. All replies held in strictest confidence.

PERSONNEL DEPARTMENT
THE LIQUID CARBONIC CORPORATION
3100 SOUTH KEDZIE AVENUE
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WANTED

Foundryman for sales work. Must be capable in cupola operation, maintenance and sand control. Travel Midwest.

BOX 914, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SERVICE ENGINEER WANTED

Young man, with foundry sand experience, college education, and native intelligence has a real opportunity with growing, aggressive supply company if he is sales minded and is willing to travel, learn and work. Send complete record, photograph and salary requirements.

BOX 950, FOUNDRY
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EXPERIENCED FOUNDRY FOREMAN

30 TO 40 YEARS OLD, TO TAKE CHARGE OF OUR STAINLESS AND HEAT RESISTANT STEEL MOLDING DEPARTMENT. MUST BE WELL RECOMMENDED AND IF POSSIBLE HAVE EXPERIENCE IN HIGH ALLOY SHELL MOLDING. OPENING IS DUE TO PROMOTION.

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With some production experience desirable for industrial sand producer.

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FOUNDRY METALLURGIST RESEARCH

Unusual opportunity in foundry laboratory of large mid-west jobbing foundry producing iron and steel castings. Recent metallurgical graduate will find a challenging position with a growing company. Salary open. Forward detailed resume. Address: Box 929, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLEANING ROOM FOREMAN

Most modern and progressive steel foundry in the middle west. Advise full particulars. Address: SWEDISH CRUCIBLE STEEL CO., 8561 BUTLER AVE., DETROIT 11, MICHIGAN.

CLASSIFIED ADVERTISING

Help Wanted

CUPOLA SUPERVISOR

For large expanding industrial concern located in Southwest area. Must have good metallurgical and foundry experience background. This job offers excellent opportunity for applicant selected. Submit complete resume of work history, personal data and salary expectations in first letter.

BOX 956, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

ESTIMATING ENGINEER

Investment castings, age 25-35 with machine shop, foundry or mechanical engineering training, not necessarily graduate. Must have thorough knowledge of precision investment casting manufacturing procedures and techniques. Usual company benefits. Salary commensurate with ability and experience. Please submit complete resume. All replies confidential. Address: **HITCHINER MANUFACTURING CO., INC., MILFORD, NEW HAMPSHIRE.**

FOREMAN

Capable of supervising pattern shop restricted to pattern repairs and gating. Also die shop production and repair of straightening dies for hydraulic presses in malleable operations. Personnel composed of five patternmakers and two die shop employees. Must also be capable of pattern design and lay-out for new production. Salary Open. Address: Box 947, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SERVICE ENGINEER

For progressive research organization in gray iron castings field. Must have engineering training and at least five years' practical foundry experience. Must be willing to travel and be interested in application of results of research work to plant practice. Salary commensurate with ability. In replying give educational background, foundry experience, and brief biographical sketch. Address: Box 941, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY ENGINEER

Challenging position in management engineering for young foundry engineer prepared to travel. Must know gray iron foundry operations, able to make layout drawings. Industrial engineering experience desirable. Reply with photo and state age and salary required. Address: Box 959, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

NONFERROUS FOUNDRY FOREMAN

Medium-size aluminum foundry near Cleveland, specializing in medium and large jobbing work. Must know all phases of foundry operations and aluminum alloys. In reply give age, experience, references and include photograph. Address: Box 926, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST OR ENGINEER

With experience in induction furnace operation melting aluminum. Must be capable of supervising production operation in special casting process. Excellent opportunity for growth with fast expanding company. Location Midwest. Submit full resume of education and experience and salary requirements. Address: Box 892, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MELTING METALLURGIST

Tool Steels, Stainless Steels, Superalloys. Staff level for manufacturing control, research and development on melting practice, induction and arc furnaces; specific experience in these alloys required. Some consultation with customers. New operation in old established company. Salary open. Location: Industrial Great Lakes. Address: Box 942, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ASSISTANT PLANT MANAGER

To assist in managing of cast iron plumbing fixture plant. Give full particulars. Good opportunity and salary. Address: Box 952, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

TOP EXECUTIVE

Offers 27 years of most extensive experience in all phases of steel foundry operations, plant engineering and maintenance. Whatever the problem in foundry engineering or management, it has been worked upon. A graduate registered mechanical engineer. Age 50. At present employment for 13 years. Desire change for good reason. If there is a tired President or General Manager who needs a right hand, write in confidence to:

BOX 939, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SUPERINTENDENT OR GENERAL FOREMAN

Gray iron or nonferrous. Prefer small to medium shop, jobbing or production. Practical man, thirty years' experience, molder, foreman, superintendent. Well versed all departments. Available immediately. Address: Box 955, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PATTERN SHOP FOREMAN AND CASTING BUYER

Desire position either as pattern foreman and estimator or as pattern engineer and casting buyer. Like to travel, prefer position in West or far Midwest. Address: Box 923, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GENERAL FOUNDRY FOREMAN

Seventeen years' foundry supervision experience, capable of handling small or large forces. Cost conscious, high production rate in either iron, brass or steel. Will relocate. Address: Box 922, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GRAY IRON SUPERINTENDENT

Age 40, seeking location in Milwaukee or midwest area, 22 years' experience. All phases. Address: Box 906, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CORE ROOM FOREMAN

Sixteen years in coreroom supervision, steel and gray iron. Experienced in all types of coremaking. Rig boxes for blowers. Very good on production and handling personnel. Address: Box 940, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MELTING SUPERINTENDENT—STEEL

Electric and open hearth. Basic and acid practice. Sixteen years' superintendent experience. Thorough knowledge of alloy and carbon steels. Address: Box 946, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CHIEF MECHANICAL ENGINEER—EXECUTIVE

Outstanding performance record in foundry machinery, materials handling, foundry design and operation, process equipment. M.E. degree. Age 49, married. Desire responsible position with progressive equipment manufacturing, foundry or consulting firm. Address: Box 938, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Thorough knowledge of all phases of nonferrous metals. Understand gating, jobbing, floor, machine and plumbers supplies. Can also produce pressure tight and porous free castings. Know sand control and core room work. Address: Box 955, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

INDUSTRIAL ENGINEER

Four and a half years' mechanized gray iron foundry experience. Acquainted with all phases of foundry operation. Can reduce costs and increase production. Married, age: 30. Resume on request. Address: Box 913, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

EXPERIENCED PRACTICAL FOUNDRYMAN

On both iron, steel and manganese steel. Have been general foreman, superintendent and consultant. Married and 56 years old. Best of references. Address: Box 915, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER OR SUPERINTENDENT

Twenty-five years of practical and technical foundry experience in ferrous and nonferrous metals. Light and heavy jobbing and production foundries. Manager and superintendent for the past eighteen years. Cost minded. Good trouble shooter, with best of labor relations. Age 45. Now employed. Address: Box 935, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

WORKS MANAGER—SUPERINTENDENT

University education, 21 years' experience in plain and alloy gray irons, carbon, low and high alloy steel. Castings from ½ lb. to 15 tons, know electric arc, induction, open hearth furnace and cupola operation. Have been metallurgist and chemist, superintendent, works manager, general manager, vice president, foundry consultant. Will relocate. Age 46, married. Address: Box 951, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

COREROOM FOREMAN

Age 47. Experienced in all phases of coremaking. Rig boxes for all types of core blowers. Very good on production. Will relocate. Would be interested in selling proposition. Address: Box 945, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WORKS MANAGER-SUPERINTENDENT

Capable of operating a 350 man organization, 23 years of experience in casting ferrous and nonferrous metals in sand, permanent and investment molds profitably. Address: Box 953 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED

Position as buyer of pattern equipment and castings with consumer concern. Age, mid-thirties, married and desire to relocate. Sixteen years' experience with foundry industry and consumer use. Address: Box 921, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLEANING ROOM FOREMAN

Twenty-five years' experience in all phases of this work. Ferrous and nonferrous castings. Free to locate anywhere. Address: Box 936, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

EXECUTIVE

Experience in all phases of foundry operations and management. Thorough knowledge of machine shop, pattern shop, engineering, metallurgy, foundry cost and estimating, sales and industrial relations. Registered mechanical engineer, 25 years' experience foreman, superintendent, general manager and vice president. Foundry running 150 tons daily. Address: Box 904, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundry Consultants

HAROLD J. ROAST, FIM, FCS

BRONZE FOUNDRY CONSULTANT

50 YEARS' EXPERIENCE

AVAILABLE COAST TO COAST

140 GROSVENOR AVENUE

OTTAWA, ONTARIO, CANADA

ELECTRIC FURNACE CONSULTANT BASIC AND ACID PRACTICE

Supervisor on electric furnaces for 35 years. Thorough knowledge of:

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PERMANENT MOLD METHOD AVAILABLE

THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and nonferrous metals and invites inquiries from any country regarding this method and process.

OPPORTUNITY

Important British manufacturer of foundry supplies, leader in development of binders for the CO_2 process, seeks reliable concern in the U.S.A. interested in acquiring an exclusive manufacturing and selling license for its binders. Write briefly stating manufacturing facilities and selling organization. Address: **R. K. PRICE ASSOCIATES, INC., 624 MADISON AVENUE, NEW YORK, N. Y.**

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National Placement and Procurement of

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Confidential Inquiries Invited

From Employers and Qualified Applicants.

For Fast Competent Assistance Contact

DRAKE PERSONNEL, INC. **HARRISON 7-8600**

JOHN COPE, DIRECTOR **220 SOUTH STATE ST., CHICAGO, ILL.**

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MOLDING MACHINE REPRESENTATION

Experienced foundry manufacturer's agent or equipment supply house capable of sales engineering and servicing a nationally advertised line of molding machines and allied equipment. Please give detailed information about yourself, territory covered and other lines handled in your first letter.

BOX 927, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

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Through our advertising in FOUNDRY and other trade magazines, we are receiving inquiries for our strainer cores, pouring pipes and other ceramic specialties. We require experienced sales representatives to contact these interested prospects and introduce our line of products to all foundries in several good territories. Please give detailed information about yourself and other lines handled in first letter. Address: MR. C. L. EVANS, UNIVERSAL CLAY PRODUCTS CO., SANDUSKY, OHIO.

SALES REPRESENTATIVE

Three primary foundry areas need effective sales coverage—Michigan, Ohio, and Western Pennsylvania. We are manufacturers of mold handling, and sand conveying equipment. Representatives handling equipment and with foundry and engineering experience are desired. Address: NOMAD FOUNDRY EQUIPMENT DIVISION of WESTOVER CORPORATION, 3110 W. FOND DU LAC AVE., MILWAUKEE 10, WIS.

REPRESENTATIVES

To sell Pressure Cast Matchplates. Will give exclusive territory. Address: Box 930, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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FOR SALE
Land and Buildings
of
THREE RIVERS CASTING CO.
Three Rivers, Michigan
BARGAIN AT $55,000.00

Brick and concrete block and steel construction, concrete floors; 28,000 square feet. Served by New York Central RR and Michigan Central RR. Lloyd-Thomas Appraisal $175,000.00 plus land. Oil fired boiler; overhead heating units; sprinkler. With or without foundry equipment. Immediate possession. Complete details upon request.

BOX 937, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOR SALE OR RENT

Modern aluminum and bronze foundry
Molding Machines; Core Machines;
Wheelabrator, in operation,
Capacity—Twelve Molders
Location—New York City

Can supply approximately $300,000 worth of work per year.

BOX 928, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY FOR SALE

Small iron foundry fully equipped, with railroad siding, ready to operate. Location: Lincoln, Nebraska. Building and real estate go with business. Sale necessary to settle estate. Address: **JOSEPH J. CARIOTTO, FEDERAL SECURITIES BUILDING, LINCOLN, NEBRASKA.**

Foundry For Lease

FOR LEASE

Foundry—Eastern Massachusetts
Gray Iron—Well Equipped
Capacity up to 15 tons per day
Also some aluminum capacity

CONTACT: EDWIN HOBBS
203 CHELSEA STREET
EVERETT 49, MASSACHUSETTS

Wanted-To-Buy

WANTED TO BUY

Southern Foundry wants to purchase for cash following used equipment in good condition.
1—10,500 CFM 20 ounce cupola blower 85 HP, 440 volt, totally enclosed motor.
1—14,100 CFM 2½# cupola blower with 200 HP, 440 volt, totally enclosed motor.
2—No. 3 UD or No. 3 F Simpson Mixers.
In reply state price, location, guarantee, condition and age of equipment.

BOX 918, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

WANTED TO BUY

Muller, up to 600 lb. batch; American 27 x 36 shot blast or equivalent; 5 to 10 H.P. air compressor; centrifugal blower, approximately 1500 cfm at 16 oz.; two No. 1 Redford core blowers; Small cut-off wheel.

WAYNE EDWARDS
R.R. 2, BOX 287
LANSING, MICHIGAN

WANTED TO BUY
Used Crane Runway

Runway, rails and supporting A frames for 15 ton bridge crane. Span 56 ft. 11 inches x 240 of travel. Foundry to top of rails 40 ft., crane wheel loads 30,500# on 11 ft. 9 inch wheel base.

BOX 949, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

WANTED

Match plate or original patterns for unusual decorative accessories. Will pay cash. Address: VIRGINIA METALCRAFTERS, WAYNESBORO VIRGINIA.

WANTED TO BUY

One-quarter or one-half ton acid electric furnace. Address: Box 916, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED TO BUY

BEARDSLEY & PIPER MIXER—Size No. 30. Speed Muller. In reply state price, condition and location. Address: Box 917, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Wanted-To-Buy

WANTED

3 Phase Direct Arc Furnace, rated ¾ to 1 Ton capacity, complete with all parts other than transformer and controls associated with transformer room. Top charge of no interest.

BOX 958, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

WANTED TO BUY

66"-72" Cupola with or without blower or charger. Must be late model and in good condition.

MEECH FOUNDRY, INC.
9906 MEECH AVENUE CLEVELAND 5, OHIO

For Sale

FOR SALE

TURBO BLOWERS WITH MOTORS

CFM	PRESS.	MAKE	CFM	PRESS.	MAKE
8375	20oz.	Spencer	340	20oz.	A-B
6000	32oz.	Ing.-Rand	320	12oz.	Spencer
4700	32oz.	Ing.-Rand	250	12oz.	No. Am.
2500	7oz.	Sturt.	9000	6"SP	Northern
800	13oz.	Buffalo	3420	8"SP	N.Y.
500	12oz.	Buffalo	2700	⅝"SP	Ilg
450	7oz.	Spencer	2500	½"SP	American
400	16oz.	No. Am.	1100	4½"SP	Bayley
380	16oz.	No. Am.	2344	2"SP	Clarage

THE MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVE.
CLEVELAND 14, OHIO

FOR SALE

Foxboro air weight controller, model 10, type 113, serial No. 887871.
Jeffrey Vibrating Feeder, type 3, serial No. 20449, size 12" x 10'5", with rectifier.
Jaeger mobile crane, 18' boom, solid tires. 5 ton capacity.

MEECH FOUNDRY
9906 MEECH AVENUE
CLEVELAND, OHIO
TELE: MICHIGAN 1-5550

FOR SALE

Roots - Connersville positive pressure cupola blower with 440 volt motor and magnetic control. Complete with Foxboro volume control, piping, pulsation snubbers and air filters. An up-to-date outfit for a cupola lined to 60" diameter or less. Inquire.

THE BOWLER FOUNDRY COMPANY
4255 EAST 49th STREET
CLEVELAND 5, OHIO
PHONE: WY. 1-4962

FOR SALE

Heller Universal Cold Saw complete with motor, control, table. Includes Heller Saw Sharpener and a lot of 26" and 28" saws. Machine capacity up to 8½" round stock. In excellent condition. Priced to move from storage quickly. Write for price and details.

BOX 925, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

CLASSIFIED ADVERTISING

For Sale

FOR SALE

MOLDING MACHINES
1—Herman, Jolt, Rollover Draw, 6000#, 40" x 60" table.
2—International, Jolt, Rollover Draw, 24" x 10G, Stationary.
2—International, Jolt, Rollover Draw, 20" x 8-G. Portable.
2—No. 275 Osborn jolt squeezers. Stationary.

CORE OVENS
1—Coleman Recirculating 3 section with 5 drawers per section. Gas fired.
1—Coleman Recirculating 4 section with 5 drawers per section. Gas fired.

BLOWERS FOR CUPOLAS AND FURNACES
1—Connersville Rotary Blower, 3500 CFM.
2—#7½ Roots rotary blowers—27 x 81—14000 CFM.
2—Connersville Rotary 14" x 27" HD, 2750 CFM at 5# press.
1—Connersville rotary blower 22 x 66 45 cu ft per revolution 9000 CFM.
Maxson-Premix Blowers for Gas ¼ to 1 HP.
2—2 HP 20-oz. Spencer Turbine Blowers.
2—Spencer Turbine Blowers, 3000 CFM, 24 oz., 30 HP, 3/60/220-440 V.

METAL MELTING EQUIPMENT
1—1000# open flame brass melting furnace, gas fired.
1—Hausfeld Stationary Brass, oil or gas burner, 200# cap.
1—Hausfeld Tilting crucible, gas, 250# A1, Cap.
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired.

MISCELLANEOUS
1—Curtis 2 cyl. 25 h.p. compressor unit.
1—Pangborn 1 to 4 nozzle air blast generator, complete.
1—Sullivan, 2 stage compressor, 14-8¾ x 10, 75 HP.
1—Sly Tumbler 24" x 40".
1—International SB-11 core blower.
2—Pangborn cloth screen collectors, 2 HP.
1—Stoney crane type shakeout.
1—NPD Royer sand separator.
1—#16 Roto-clone unit complete.
Complete stock of rebuilt mill and dust exhaust blowers.

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

FOR SALE

1—60" Reversible "Moulders' Friend" Sand Conditioner, 100 ft. of cable, 15 H.P., 1750 R.P.M. totally enclosed motor and 1/3 H.P. Motor, 3 phase, 60 cycle, 440 volts. Travel speed 30 F.P.M.

THE GRABLER MANUFACTURING CO.
6565 BROADWAY
CLEVELAND 5, OHIO

FOR SALE

1—Hydroscale—300 lb. capacity—12 inch dial, 5 pound graduations—like New	$195.00
1—#1 Demmler Core Blower—6 x 12 Magazine	$250.00
1—Porter Cable 15 Inch Disc Sander	$ 95.00

DOSTAL FOUNDRY AND MACHINE CO.
PONTIAC, MICHIGAN

FOR SALE

2" and 4" soil pipe machines, core machine and arbors. 100 shell type fitting patterns and snap binders. All or any part cheap. Address: HERBERT J. BROWN, 2008 PORTLAND AVENUE, SHREVEPORT, LOUISIANA.

FOR SALE

#4 Sly Blast Mill, complete with motor and reducer in very good condition. Address: EUCLID BRASS FOUNDRY, INC., 1701 OCTAVIA ROAD, CLEVELAND 12, OHIO.

For Sale

FOR SALE

INGERSOLL-RAND AIR COMPRESSOR, TYPE XRE, Ser. #PP BE104-105—1939
175 HP Synchr. motor 220/3/60—2 stage 14" x 12" 6" x 12"
638-C.F.P.M.—470 C.F. Free Air P.M.
Max Delvy. 450# PSI
Intercooler—Aftercooler
Automatic Lubricating System, with comp.
Elec. Mach. Automatic Control Panel — Size SPT-6.

SEABOARD STEEL COMPANY, INC.
P.O. BOX 1135
NEW HAVEN, CONNECTICUT

CLASSIFIED ADVERTISERS

PLEASE NOTE!

Our next issue is the special Pre-Convention issue—MAY. Copy for this issue must reach us one week earlier than usual. Deadline is April 6. Thank you for hurrying copy to us and remembering: it pays to advertise in FOUNDRY's classified!

FOR SALE

Wheelabrator Tumblast 36" x 42" complete with dust collector, motors, controls	$3250.00
Wheelabrator Cabinet, size 30' x 15'4", will handle work 3'8" x 5'7", complete	5500.00
American Wheelabrator Cabinet 48" x 10' long, will handle plates 4' by 10", complete	7500.00
American 1A table 7-14" multitables	900.00
Pangborn 2 GF Barrel, capacity 3 cu. ft.	450.00
Pangborn 9' LG table, 7-28" multitables, complete	6000.00
Tabor 10" Molding Machines	100.00
Tabor 10" top squeeze, swinghead	225.00
Tabor jolt squeeze stripper	375.00
Berkshire swing head jolt squeeze 10"	175.00
Gardner Vertical Disc Grinder 30", 7½ HP motor	600.00
American Wheelabrator loader 27" x 36"	300.00
Gehrich preheat oven 6' wide x 6' deep x 4' high, 600 degrees F., complete, unused	1100.00
Burring booth, Newcomb-Detroit, magnesium, 15 HP motor, unused	1400.00
Uniwash dust collector, 5600 CFM, Newcomb-Detroit 10 HP motor	1000.00
American Rotoclone dust collector, sludge type, 2500 CFM 5 HP, 3/60/220	750.00
Core oven, Genrich, 10' x 7' x 4', gas fired	300.00
Wire cutter, Climax ¼-$\frac{5}{16}$	225.00
American Dustube, No. 185, capacity 16950 CFM with 25 HP motor, Claridge blower	1800.00
American Dustube, No. 35 complete with blower and motor	275.00
Pangborn 4' rotary turn table type LE	450.00
Pangborn EN2 cabinet with dust collector	475.00
Detroit, Gogan, Tinius Olson hardness testers, motorized	200.00
Pangborn, American, MacLeod, Ruemelin automatic sand blasting generators	250.00
Wheelabrator parts in stock, sand blasting parts	

M. ELSTEIN
426 GRAND ST.
JERSEY CITY 2, N. J.

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

For Sale

WE PROUDLY ANNOUNCE THE OPENING OF OUR NEW OFFICE AND WAREHOUSE IN LARGER QUARTERS TO SERVE YOU BETTER

OPENING SPECIAL
Osborn Power Rollovers—Model 2047-4; Cap. 18" x 24"; stationary; 1942 machines. These machines cost the government $4,000.00 They are in excellent condition. As an opening special we offer them for $250.00 each.

JOLT ROLLOVER MOLDING MACHINES	
#918 Johnston & Jennings—44" x 54"; 18" draw; no pit required	$1250.00
International—Type F; 31" x 12"	350.00
#601 Osborn; 750 lb. cap.; 30" flask	350.00
#602 Osborn; 750 lb. cap; 36" flask	450.00
#605 Osborn; 750 lb. cap; 54" flask	650.00
Tabor 30" x 40"; extends to 69"; 12" draw, shockless type; 1500 lb cap.	950.00
JOLT STRIP MOLDING MACHINE	
#559 Osborn—25 x 30; 1200 lb. cap.	550.00
JOLT SQUEEZE STRIP MOLDING MACHINES	
#143 Milwaukee	350.00
#163 Milwaukee	450.00
#183 Milwaukee	550.00
Nichols—Type B; 14" cyl. 14" x 36"	250.00
#211 SPO	550.00
#213 SPO—19 x 26; 4½" jolt cyl.; 13" sq.	750.00
#2114 SPO—14 x 24; 11" sq. cyl.	650.00
#2136 SPO—13" sq. cyl.	750.00
#720 PJ Osborn—31 x 44; 11" sq. cyl.	550.00
JOLT SQUEEZERS	
Nicholls—Type D	250.00
Osborn—#275 J 16 x 20; 10" sq. cyl.	275.00
Osborn—#276 J	350.00
PUSH OFF MACHINES	
Champion—Model LLA-45; 45 x 26" used with sandslinger	350.00
International; Model LP-Portable Pin Lift; 30 x 40 used with sandslinger	350.00
Core Blowers—Core Rollovers	
#193 Osborn—for med. cores	650.00
#94 Osborn—for large cores	750.00
Osborn Hand Rollovers—Model 42	100.00
MATERIAL HANDLING EQUIPMENT	
Model HA Hough Payloader	1000.00
Clark Fork Lift Truck—6000 lb	1000.00
Baker Raulang Fork Lift Truck—6000 lb	1000.00
Elwell Parker Fork Lift Truck—4000 lb	1000.00
Yale Fork Lift Truck—6000 lb	1000.00
Mercury Fork Lift Truck—2000 lb. Elec.	1000.00
Lewis-Shepard Platform Lift Trucks	150.00
FURNACES	
Stroman—2000 lb. Tilting Hydraulic	1500.00
CORE OVENS	
Dielectric—Model 900A and 1800A. Set up in your shop in operating condition. Less than ½ new price	12,000.00
MISCELLANEOUS FOUNDRY EQUIPMENT	
U. S. 7½ HP 3 speed grinder; 28" wheel	450.00
U. S. Adjustable speed grinder-Model 64; 20" x 2" x 3"	550.00
Ingersoll-Rand pneumatic hoist with trolley, size C	150.00
Beardsley & Piper Sandslinger; 19" head 4" cup, 4' ramming arm	1750.00
Model S B & P Screenerator	225.00
Royer Screenerator	250.00
Climax Wire Straightener	400.00

FOR THE BEST DEAL CALL
BALCHER MACHINERY COMPANY
695 E. 152nd STREET
CLEVELAND 10, OHIO
TELEPHONE: GLENVILLE 1-2474

FOR SALE
MOTORS—GENERATORS
TRANSFORMERS
Unused — Rebuilt

WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT COMPANY
Phone Station Collect GLenwood 6783
P.O. Box 51—Rochester 1, New York

For Sale

SAND BLASTING EQUIPMENT

We Buy, Sell and Trade

15 x 20	Wheelabrator with dust collector	$1600.00
27 x 36	Wheelabrator, rubber belt	3000.00
36 x 42	Wheelabrator, steel belt	3000.00
42 x 48	Wheelabrator, steel belt	3000.00
48 x 48	Wheelabrator, steel belt	4500.00
15 Inch	Continuous Wheelabrator	2000.00
6 ft.	Wheelabrator, flat top	2500.00
9 ft.	Pangborn L.F. Table (one side throw wheel)	4000.00
9 ft.	Pangborn L.F. Table (two side throw wheel)	5000.00
1½ cu. ft.	Pangborn air blast barrel	350.00
ES-421	Pangborn shell blasting machine	3000.00

Tumbling Barrels, horizontal and vertical.

Hand Blast Cabinets—Pangborn, American and Ruemelin.

Dust collectors all sizes from 100 CFM to 5000 CFM.

New wear parts for Pangborn Motor Block conveyor type blasting machine.

Dust collector. Pangborn CK 220, 2000 CFM.

DIAMOND SAND-BLAST, INC.
5654 WEST JEFFERSON
DETROIT 9, MICHIGAN
PHONE: VINEWOOD 3-6751

FOR SALE

Detrex Degreaser. Model US800-S. Size 84-36-36 with 2 baskets. Purchased Jan. 1955. Like new. Three Osborn Drag Molding Machines, type 332-49.

Link-Belt Mold Conveyor, including drive and 98 cars size 24" x 60".

ALBION MALLEABLE IRON COMPANY
ALBION, MICHIGAN

For Sale

FOR SALE

One Robbins Portable Shakeout, 6 ton cap.—550 volt—3 phase, 7½ HP and 1½ HP motors. Used 2 years.

Today's Price $9800.00.

We will sell for $2950.00.

F.O.B. Worcester, Mass.

RICE BARTON CORPORATION
65 TAINTER STREET
WORCESTER, MASSACHUSETTS

FOR SALE

Lindberg Hydryzing furnace 20 KW, 2000 F.

Molding machine, Milwaukee #214

Gardner vertical disc grinder 53"

Gardner horizontal disc grinder #7½, 30"

Simplicity shakeout table 36" x 60"

Ingersoll Rand turbo compressor 6000 cfm.

Sturtevant vane controlled fan 400 HP.

Buffalo exhaust blowers 600 HP.

Pangborn Table Blast 72".

WEBER MACHINERY COMPANY
8200 BESSEMER AVENUE
CLEVELAND 27, OHIO

For Sale

FOR SALE

We have the best selection of HARD CHROME REBUILT PNEUMATIC TOOLS WE HAVE EVER HAD.

Ingersoll-Rand Size 24 Floor Rammers

Ingersoll-Rand Size 14 Bench Rammers

Cleco Bench Rammers

Chipping Hammers—All types

Core Breakers and Grinders

Our prices are about half the cost of new tools. All tools sold by us are guaranteed and can be returned if found not satisfactory.

CENTRAL PNEUMATIC SERVICE COMPANY
512 LINDEN AVE., DAYTON, OHIO
TELEPHONE: MADISON 2701

FOR SALE

1—Simpson Mixer #2, 20 HP motor.
Miscellaneous: Screens, Pulverizers, Grinders, Tyler Rotap Screens, etc.
Wanted: Your Idle Machinery.

OUR 39th YEAR.

CONSOLIDATED PRODUCTS CO., INC.
66 BLOOMFIELD STREET
HOBOKEN, NEW JERSEY
HO 3-4425 **N. Y. TEL. BA. 7-0600**

CLASSIFIED ADVERTISING RATES

POSITION WANTED—Minimum advertisement set solid, 30 words or less, $3.00. Additional words 10c each.

ALL OTHERS—"Help Wanted"—"For Sale"—"Wanted"—"Personals"—"Services", etc., minimum advertisement set solid, 30 words or less, $6.00. Additional words 20c each.

NOTE—If replies are to be sent to a box number in care of FOUNDRY, add 8 words to your advertisement for box number and address.

Any advertisement set in all capital letters, add 50% to the above rates.

INCH RATES PER INSERTION

Single Column 2¼" Wide	One Time	Three Times	Six Times	Twelve Times
1 inch	$ 18.00	$ 16.50	$ 15.00	$ 13.50
2 inches	32.50	30.00	27.50	25.00
3 inches	46.50	43.00	39.50	36.00
4 inches	60.00	55.50	61.00	46.50
5 inches	73.00	67.50	62.00	56.50
6 inches	85.50	79.00	72.50	66.00
7 inches	97.50	90.00	82.50	75.00
8 inches	109.00	100.50	92.00	83.50
9 inches	120.00	110.50	101.00	91.50
10 inches (1 col.)	130.50	120.00	109.50	99.00
Half page	195.00	180.00	165.00	150.00
Full page	330.00	300.00	270.00	240.00

Remittance should accompany advertisement when submitted—Cash Discount 2%, 10 days.

Classified Forms Close the 13th of Month Preceding Issue

FOUNDRY

PENTON BUILDING • CLEVELAND 13, OHIO

AAA MACHINERY & EQUIPMENT CO.

over 1000 satisfied customers

WORLD'S LARGEST INVENTORY OF GUARANTEED FOUNDRY EQUIPMENT

AIR COMPRESSORS

1—INGERSOLL RAND Model ER1 12" x 10", 320 C.F.M., 60 HP. w/Receiver.
1—INGERSOLL RAND, Model ES1, 12" x 11", 320 CFM, complete with 60 HP AC motor, and accessories.
1—SULLIVAN Type WN-3, 20" x 12" x 14", 1220 C.F.M., 250 HP.

AIR HOISTS

75—INGERSOLL RAND RC-5, 500 lbs.
10—INGERSOLL RAND LC-7, 700 lbs.
3—INGERSOLL RAND Size "AN" 500 lbs.
6—INGERSOLL RAND Size "B" 1000 lbs.
2—INGERSOLL RAND Size "C" 2000 lbs.
2—INGERSOLL RAND Size "D" 4000 lbs.
4—INGERSOLL RAND Size "D-6" 6000
4—INGERSOLL RAND Size "E" 10,000
5—CHICAGO PNEUMATIC 2-3-5 Ton Cap.
16—DETROIT 1-2-5 Tons Cap.
3—THORS 2-3-5 Tons Cap.

BUCKET ELEVATORS

1—LINK BELT 30' Centers, 10" x "" Buckets, w/Motor and Drive.
1—LINK BELT 35' Centers, 12" x 7" Buckets, w/Motor and Drive.
1—LINK BELT 40' Centers, 14" x 7" Buckets, w/Motor and Drive.
1—LINK BELT 50' Centers, 16" x 8" Buckets, w/Motor and Drive.

AIR TOOLS

200—INGERSOLL RAND & CHICAGO PNEUMATIC, Grinders, Chippers, Bench & Floor Rammers.

ELECTRIC HOISTS

1—Comet 1000 lbs, capacity.
1—SHAW Box 1000 lbs. capacity.
1—CLEVELAND 4000 lbs. cap. with powerized Trolley.
1—ROBBINS & MEYERS, 4000 lbs. cap.

CUT-OFF MACHINES

1—DEWALT model ME2 cut-off saw, 10 HP motor, 24" Carboloy blades.
3—TABOR model C10AF, Abrasive Disc, 16" Wheel, 10 H.P. Motor.
1—TESSEMER Model H, ¾" Cap. Sprue Cutter.
1—TESSEMER Model I, ¼" Cap. Sprue Cutter.

CORE ROD STRAIGHTENERS

1—AMERICAN Type D, Pneumatic ¾" Straightener, 1¼" Shear.
2—CLIMAX #2, 2A, 1/16" to ¼".
1—CLIMAX #3, ¼" to ⅜", Length 10".

CORE GRINDERS

2—MILWAUKEE Rotary Type, Model 70-12, 70" Dia. Table, Very Late.

CORE BLOWERS

2—CHAMPIONS CB 10, Max. Core 10 lbs.
2—CHAMPIONS CB 400, Max. Core 300.
1—DEMMLER No. 55 Max. Core 6 lbs.
1—DEMMLER No. 1, Max. Core 10 lbs.
1—DEMMLER No. 1-E, Max. Core 10 lbs.
2—DEMMLER No. 2K, Max. Core 20 lbs.
2—DEMMLER No. 2E, Max. Core 20 lbs.
2—DEMMLER No. 2, Max. Core 20 lbs.
2—DEMMLER No. 3, Max. Core 35 lbs.
2—DEMMLER No. 3K, Max. Core 35 lbs.
2—DEMMLER No. 3E, Max. Core 35 lbs.
1—DEMMLER No. 4, Max. Core 100 lbs.
1—DEMMLER No. 4E, Max. Core . . lbs.
2—INTERNATIONALS No. SB, 11 Max. Core 15 lbs.
2—INTERNATIONALS No. SB 13, Max. Core 30 lbs.
1—OSBORN No. 91, Max. Core 15 lbs.
2—OSBORN No. 92, Max. Core 35 lbs.
2—OSBORN No. 192, Max. Core 50 lbs.
2—OSBORN No. 193, Max. Core 75 lbs.
6—MILWAUKEE TACCONE Model A-3, Max. Core, 4 lbs.
1—REDFORD #1 Bench Type w/cartridges.

CORE OVENS

1—INDUCTION Heating Dialectric, Model M-800A, 600 lbs. per Hr. New.
1—INDUSTRIAL "Revolving Carriers" Continuous, Trays 18" x 80", Gas Fired.
1—DETROIT Vertical Tower, 45' High, Trays 14" x 60", 31" Centers.
1—YOUNG BROS. 2-Comp. 10 Drawers, Overall 9' x 12' x 8', Gas Fired.
2—YOUNG BROS. Car Type, Single & Double Compartment, Gas Fired, Recirculating, with L & N Recorders, etc.

CORE ROOM MISC.

3000—TRANSITE Core Plates.
1—AMERICAN Rapid Core Machine.
37—NEW CORE RACKS, 5' 6" Wide, 6' High, 4' Deep, 5 Shelves, Knocked Down.
4—ROSS Single & Double Core Drawers.
20—OSBORN, INTERNATIONAL & TABOR Core Rollovers, Various Sizes.

CUPOLA BLOWERS & ACCESSORIES

1—ROOTS CONNERSVILLE, Size 20 x 44, 7000 CFM, Type HD, 50 HP Motor.
4—LINDBERG Centrifugal Blowers 2100 CFM, with 15 HP Motors.
1—BASIC REFRACTORIES BRI Gun, Model 110.
3—HAUCK Cupola Lighter & Tanks.
5—WHITING 42" Dia. Charging Buckets.

DUST COLLECTORS & ROTO-CLONES

1—AMERICAN Air Filter No. 12, Type W, arrangement "C," with Sludge Ejector.
1—AMERICAN Air Filter No. 14, Type W, arrangement "C," with Sludge Ejector.
1—AMERICAN Air Filter No. 27, Type W, arrangement "C," with Sludge Ejector.
1—AMERICAN Air Filter Type N, Size 10 with Bench.
1—AMERICAN Air Filter Type N, Size 20, 20,000 CFM, with 75 HP Motor.
1—AMERICAN Air Filter Type N, Size 24, 24,000 CFM, 75 HP Motor.

ELECTRIC ARC MELTING

2—DETROIT Rockers, Indirect Arc, Type AA, 750-1000 lbs. capacity. Complete with 200 KVA Transformers, Control Panels, Automatic Electrode Holders.
2—DETROIT Rockers, Indirect Arc, Type AA, 1000-1500 lbs. capacity. Complete with 250 KVA Transformers, Control Panels, Automatic Electrode Holders.

GAS & OIL FIRED FURNACES

1—LINDBERG FISHER Model MNP, Size 225, Electric Tilt, with Motor & Blower.
6—LINDBERG FISHER Model MNP, Size 1700, Electric Tilt, with Motor & Blower.
3—LINDBERG FISHER Model MNP, Size 2400, Electric Tilt, with Motor & Blower.
2—LINDBERG FISHER, Type BB1, Size 225, Hand Tilt, with Motor & Blower.
12—LINDBERG FISHER, Model SSH, Size 550, Stationary, Complete Motor & Blower.
6—LINDBERG FISHER, Model SSH, Size 150, Stationary, Motor & Blower.
3—LINDBERG FISHER, Model SSH, Size 60, Stationary, Motor & Blower.
10—CAMPBELL HAUSFIELD, Stationary, Size 125 to 250.Motor & Blower.
2—CAMPBELL HAUSFIELD, Model 1PNT, Size 2000 lbs., Electric Tilt, with Motor & Blower.

GRINDERS—SWING FRAME

1—MARSHKE, 12" x 2", 3 HP.
1—MARSHKE, 20" x 10", 10 H.P.
2—FOX, No. 6, 24" x 10", 15 HP.

GRINDERS—SNAGGING

3—U. S. ELECTRICAL, No. 65, 24" x 3" x 12" Wheel, 15 HP, 4-Speeds.
3—U. S. ELECTRICAL, No. 65, 30" x 4" x 12" Wheel, 20 HP, 4-Speeds.
2—U. S. ELECTRICAL, No. 64, 14" x 3" Wheel, 7½ HP, 4-Speeds.
1—HAMMOND, Model WR-1, 24" x 3" x 12" Wheel, 10 HP.
2—SAFETY BITES, No. 174, 24" x 3" x 12", 10 HP.

GRINDERS—DISC

1—QUEEN CITY, Model 100 Double End Disc Grinder, wheel size 20" x 2" x 2", with 10 HP Motor.
1—U. S. ELECTRICAL TOOL, No. 80. Double End Disc Grinder, Wheel size 16" x 3", with 7½ HP Motor.

HEAT TREAT FURNACE

2—LINDBERG, Model 4860 GH, Gas Fired 48" x 60", Recirculating, with L & N Controls to 1250° F.
1—LOFTUS ENGINEERING CORP. Annealing, Walking Beam Type, Gas Fired, 1600°, Recirculating, 10' x 12' x 40'. New 1951.
1—AMERICAN, Model 150-DC, ID 5" x 10" x 18". To 2350° F.
1—AJAX MFG. Electric, ID 54' Long, 46" Wide, 36" High, 800°. Single Phase..

HOUGH PAYLOADERS

2—HOUGH model HA, 12 cubic ft. capacity, hydraulic buckets.

INDUCTION—MELTING HEAT TREAT

1—GENERAL ELECTRIC MG Set, 300 KW, 450 HP Motor, 3000 Cycles, with Starter & Panel Boards.
1—GENERAL ELECTRIC MG Set, 1250 KW, 1850 HP Motor, 3000 Cycles, with all Controls.
1—LEPEL Spark Gap Converter, 30 KW.

LADLES

3—WHITING Cylindrical, 275 lbs. 19" x 26".
6—MODERN Cylindrical, 1500 lbs. 20" x 30".
1—MODERN mixing, 44" x 44", on wheels, 4000 lbs.
2—STEVENS Cylindrical, 2450 lbs. 29½" x 41½".
12—WHITING Lip Pour, 1200 lbs., 23" x 23".
6—MODERN Lip Pour, 1600 lbs. 24" x 24".
4—MODERN FA-9 Pouring Devices and 400# Ladles.
2—WHITING Lip Pour, 2000 lbs., 29½" x 29½".
3—WHITING Lip Pour, 4000 lbs., 32" x 32".
1—WHITING Lip Pour, 6000 lbs., 36" x 36".
3—WHITING Lip Pour, 5000 lbs., 34" x 34".
1—WHITING Lip Pour, 8000 lbs., 44" x 48".
2—WHITING Lip Pour, 20,000 lbs., 62" x 62".
2—WHITING "U" Type; 5900 lbs., 42" x 72" x 36".
2—WHITING teapots, 4000 lbs., 32" x 32".

MOLDING MACHINES JOLT SQUEEZERS

2—MILWAUKEE No. 123, 12" cyl., stationary.
2—MILWAUKEE No. 104, 10" cyl., portable.
8—OSBORN No. 275 JW, Straddle Type, 10" Cyl., Portable.
16—OSBORN No. 275J, 10" Cyl., Portable.
3—OSBORN No. 276J, 12" Cyl., Portable.
6—OSBORN No. 210 PJ, Swing Back Head, 10" Cyl., Stationary.
6—OSBORN No. 212 PJ, Swing Back Head, 12" Cyl., Stationary.
1—CHAMPION No. JS-10-P, 10" Cyl., Swing Back Head, Portable.
20—SPO No. 110J, 10" Cyl., Portable.

JOLT ROLLOVER PATTERN DRAW

1—DAVENPORT No. 28R, 34" x 48" Table, 12" Draw.
1—DAVENPORT No. 40-SA, 42" x 50" Table, 3000 lbs. Jolt, 18" Draw.
1—DAVENPORT model 24SA, 24" x 30" table, 12" draw, 1200 lbs. capacity.
1—HERMAN #6000 Series, 42" x 78" Table, 6000 lbs. Jolt Cap., 20" Draw.
1—HERMAN #1500 Series, Table 26" x 30", Jolt 1500 lbs.

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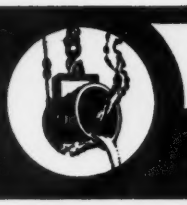

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1—HERMAN #750 Series, Table 20" x 30", 750 lbs. Jolt.
6—INTERNATIONAL "R" Core Rollovers.
1—INTERNATIONAL "G" Size 20" x 8".
1—INTERNATIONAL "G" Size 24" x 10".
1—INTERNATIONAL "G" Size 30" x 12".
1—INTERNATIONAL No. RES, Size 15" x 8".
1—INTERNATIONAL Type "F," 31" x 54", Draw 16", Jolt Cap. 2500 lbs.
1—JOHNSTON & JENNINGS model 918, 44" x 54" table, 20" draw, 2000 lbs. capacity.
1—JOHNSTON & JENNINGS model 1020B, 50" x 60" table, 3000 lbs. capacity.
1—JOHNSTON & JENNINGS #612-RP, Table 24" x 30", Draw 12", Jolt 600 lbs.
1—JOHNSTON & JENNINGS 815-B table 30" x 40", draw 15", jolt 1500 lbs.
1—MILWAUKEE #167, Table 32" x 33", Draw 12", Jolt 1000 lbs., Sq. Cyl. 16".
1—MILWAUKEE #217, Table.
1—MILWAUKEE Model 60B-3, 60" flask, 18" draw.
2—OSBORN No. 142, Table 14½" x 24", Draw 8", 350 lbs. Jolt.
10—OSBORN No. 40 and 42, Hand Core Rollovers, 18" x 8" Draw.
1—OSBORN No. 342, Table 23" x 38", Draw 10", Jolt 1000 lbs.
1—OSBORN No. 442, Table 21" x 31", Draw 10", Jolt 600 lbs.
1—OSBORN No. 242, Table 29" x 42", Draw 19", Jolt 1500 lbs.
2—OSBORN No. 405, Table 57" x 64", Draw 26", Jolt 3000 lbs.
6—OSBORN No. 601, 30" wide Flask, 10" Draw, 750 lbs. Jolt.
6—OSBORN No. 602, 36" Wide Flask, 10" Draw, 750 lbs. Jolt.
2—OSBORN No. 332, Flask Size 26" x 36", Draw 9", Sq. Cyl. 16", 1500 lbs. Jolt.
1—SPO No. 413D. Table 24" x 25", Draw 10". Jolt 600 lbs., Sq. Cyl. 13".
1—SPO No. 507, table 32" x 40", draw 10" to 20", jolt cap. 1500 lbs.
1—SPO model 506, portable, 24" x 30" table, 10" draw, 600 lbs. capacity.
3—TABOR, Size 30" x 40" Table, 12" Draw, 1000 lbs. Jolt Cap. Portable & Stationary.
4—TABOR, Size 22" x 32", and 22" x 42", Draw 10", Jolt 600 lbs.

JOLT PIN LIFT

2—DAVENPORT model 24 AJS, 24" x 30" table, 8" draw, 1000 lbs. capacity.
1—DAVENPORT No. 40 AJS, Table 44" x 54", Jolt 4000 lbs., Draw 18".
1—INTERNATIONAL Model JDP, Size 600 x 8".
1—INTERNATIONAL LP10, 30" x 30" Table.
1—JOHNSTON & JENNINGS model 812S.
1—MILWAUKEE No. 1536, Table 32" x 38". 1500 lbs. Jolt.
2—MILWAUKEE No. 620 ND, 24" x 30" Table, 2000 lbs. Jolt.
2—OSBORN No. 559, Table 25" x 30", Draw 6", Jolt 1200 lbs.
1—OSBORN No. 563, Table 55" x 63", Draw 12", Jolt 7000 lbs.
1—SPO model 307, 24" x 30" table, 8" draw, 1000 lbs. capacity.
1—TABOR, Table 22" x 32", Draw 10", Jolt 600#.

JOLT SQUEEZE PIN LIFT

1—INTERNATIONAL PKL, 12", Squeeze Cyl., 6" Draw.
1—MILWAUKEE 125-3, Table 21" x 27", Jolt 1200 lbs. Draw 8", Squeeze Cyl. 12".
2—MILWAUKEE No. 165, Table 24" x 34", Draw 8", Squeeze Cyl. 16".
1—MILWAUKEE No. 163, Table 15" x 24", Draw, 8", Jolt 1500 lbs., Squeeze Cyl. 16".
1—OSBORN model 712, squeeze cylinder 12". table 18" x 28", draw 6".
1—OSBORN 175J table 18" x 21", draw 5" sq. cyl. 10".
2—OSBORN No. 710 Table 17" x 21", Squeeze Cyl. 10".
4—OSBORN No. 716 PJ, Table 22" x 34", Draw 7", Squeeze Cyl. 16".
1—SPO 2114, table 20" x 27", 4" draw, 600 lbs. jolt, 11" cyl.
1—SPO 2136G, table 19" x 26", 6" draw, 13" cyl. portable.

JOLT (BUMPERS)

1—HERMAN, 40" x 60" Table, 13" Cyl. 6000 lbs. Jolt.
1—MILWAUKEE No. 4050, 40" x 50" Table, 12" Cyl.
1—TABOR, Table 30" x 40".

ROTO-LIFTS

2—OSBORN No. 1510, table 22" x 26", draw 20", jolt cap. 1500#, new 1949.

MATERIAL HANDLING EQUIPMENT

1—ERIE ¾ yard clamshell bucket, single line.
1—INGERSOLL RAND, Size MHU, Air Winch, 2000 lbs. Cap.
1—LINK-BELT Car Puller, 5000 lbs. cap. (3 s. Cars).
6—READY POWER UNITS, 4 x 6 Cylinder.
3—AUTOMATIC Fork Pallet Trucks, 4000 lbs. cap. 7" Lift.
6—LEWIS SHEPPARD Platform Hand Lift Trucks (For Core Room).

CONVEYOR BELTS

1—JEFFREY Trough, 20" x 35' centers.
1—JEFFREY Trough, 24" x 103' Centers.
1—JEFFREY Trough, 24" x 145' Centers.
1—JEFFREY Flat 24" x 385' Centers.
1—JEFFREY Trough 24" x 35' centers.
1—LINK BELT Flat 24" x 40' Centers.

STEEL APRON CONVEYOR

1—JEFFREY 24" x 60' Centers.
1—LINK BELT 36" x 100' centers, motor and drive.

VIBRATING CONVEYOR

1—LINK BELT 36" x 40'.
3—SIMPLICITY Model OA-10-A, 36" x 15'.

PORTABLE TROUGH CONVEYOR

1—FARQUHAR, 18" x 35'.

OSCILLATING CONVEYOR

1—LINK BELT 48" x 154'.

CHAIN CONVEYOR

500' JARVIS No. 678, complete with drives.

UNDER CAR UNLOADER

1—FARQUHAR, 18" x 19'.

TRAMRAIL

3—LOUDEN MONORAIL SYSTEMS, "Super Track"
(1) 110' of 6" I-beam & two 20' bridges
(2) 140' of 6" I-beam & two 12' bridges
(3) 130' of 11" I-beam & two 30' bridges; All Complete.

OVERHEAD CRANES

1—WHITING 5 ton Overhead Crane, 50' span, Cab Operated, AC.

MOLD DRYERS

1—PORBECK Mold Dryer, 42" wide, 8' long, oil fired, Serial No. 242.

MOLD CONVEYOR

1—WEBB 109 Cars, Car Tops 32" x 39".
1—LINK BELT, 98 Cars, Car Tops, 32" & 39".

ROLLER CONVEYOR

150' MATHEWS 36" wide, 3½" rollers, 6" centers, 6" channel, 1¼" shaft dia.
40' MATHEWS 18" wide, 2 13/16" rollers, 4" centers, 4" channel.

SAND MULLERS

1—BAKER PERKINS No. 16½, 30 HP motor.
1—BEARDSLEY & PIPER, #30 with Skip Hoist & Dust Hood, 20 HP.
1—BEARDSLEY & PIPER, #50 with Skip Hoist, Dust Hood, 50 HP.
1—CLEARFIELD, #404 Batch, 4 Cu. Ft.
1—CLEARFIELD, #610 Batch, 6 Cu. Ft.
1—MIXER MULLER 3½ cubic ft. batch, on pneumatic tires.
1—SIMPSON, #1 Style B, Single Wheel, 400# Batch.
1—SIMPSON, #3 Style C, Enclosed Gears —3000#.
2—SIMPSON PORTAMULLERS.
1—SIMPSON, #2, Style UD, 1500 lbs. Batch. With Loader.
1—SIMPSON, #2, Style C, 1500 lbs., with Loader. Enclosed Gears.
1—SIMPSON #1, style UD, 500 lbs. batch.

SAND PREPARATORS

1—B & P, No. 40, 40 Ton Hopper.
6—B & P Screenarators, Models—S, M & L.
1—PEKAY Aerator, Model 320-3. (For Sand System).
8—ROYERS, Models NDP-C-2.

SAND CUTTERS

1—AMERICAN, Model BD-Size 75/60.
1—AMERICAN, Model M-Size 99/80.
1—AMERICAN, Model M-Size 89/70.
2—MOULDERS' Friend 50" and 60" brush.

SAND SLINGERS

1—B & P, 19" Tractor Type, 13' Arm.
1—B & P, 16" Tractor Type, 13' Arm, Magnetic Tower, 4' Ramming 4" Tip.
2—B & P, Model 16S-DB Stationary Type, 16" Head.
1—B & P Stationary-Double Belt Model, 5' arm, 4' Ramming, 19" Head, 4" tip. Never Used.

SHAKEOUTS & SCREENS

4—SIMPLICITY 4' x 6' Model B, 5000#.
1—SIMPLICITY 4' x 10' Model D, 16,000#.
1—SIMPLICITY 6' x 8' Model DE, 32,000#.
1—ROYER Combination Shakeout & Sand Conditioning unit, Serial #ST-47.
1—HEWITT-ROBINS 36" x 78", Vibrex Screen, Style M-7.
1—LINK BELT 5' x 10' heavy duty.

TUMBLING BARRELS

1—ROYERSFORD 36" x 60", 5 HP Motor.
2—SLY 42" x 72" Square, 10 HP, Gearhead with Built-in Brake. Timken Bearing.
2—SLY 36" x 84" Type C, 7½ HP, Gearhead with Built-in Brake. Timken Bearing.
4—WHITING 48" x 72", 10 HP Gearhead, with Built-in Brake. Timken Bearing.

WHEELABRATORS

1—AMERICAN 86" diameter swing table with dust collector.
1—AMERICAN No. 3 tablast, 4-48" auxiliary tables.
1—AMERICAN No. 1 tablast 7-14" auxiliary tables.
1—AMERICAN 36" x 42" Tumblast with Skip Hoist.
1—AMERICAN 42" x 48" Tumblast, with Skip Hoist.
1—HOLLINGSWORTH Model 44" x 48" Tumblast.
1—HYDRO-BLAST cabinet, 40 HP motor and pump.
1—PANGBORN Shot Blast Room 10' x 12' x 14', with Dust Collector, Elevator.
1—PANGBORN 9LG, 9' Table, 8-24' Tables.

TESTING EQUIPMENT

1—GENERAL ELECTRIC X-Ray, Industrial Type. Model KX10. 140 KW.
1—STEEL CITY Brinell Hardness Tester, Model UK 300. To 3000 Kilograms.
1—STEEL CITY Brinell Hardness Tester, Model 0-4500 4¼" Piston.

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HEATING & ANNEALING FURNACES: Ingot Heating, 4'x11', 6'x10', 10'x16'; Billet Heating, 3'x5', 4'x8', 5'x7', 5'x10'; Tool Heating, 3'x3', 42" dia.; H.S. Tool Forging, Tool Treating & Salt Bath; Car Hearth Annealing, 4'x33"x8', 7'x66"-x36', 7'x33"x18', 7'x33"x36', 7'x33"x66', 5'x-48"x15', 7'x60"x72', 24"x26"x12'; Rotor Treatment, 40"x9'; Beam Furnaces, 10'x6', 6'x18" dbl. chambered; Ring Heating Furnaces; VERTICAL, 6' dia. x 16' deep, 8' dia. x 16" deep, all attachments, with QUENCHING TANKS, Industrial Power Engrg. Installed NEW 1952.

BORING MILLS: Vertical 84" Niles, 54" & 24" Bullard; horizontal 6½" Espen-Lucas, 5" Bar Floor Type, Ohio.

SHAPERS: 36" stroke American, 24" stroke G&E and 20" stroke G&E; 7" Bench Ammco.

MILLERS: #3 & #4 Cincinnati, 32"x32"x14' Ingersoll.

PLANER: 60"x60"x20' Sellers.

SLOTTERS: 60" & 48" Niles, 54" stroke Newton.

GRINDERS: 24"x168" Cincinnati, 20"x10' Landis, Diamond, Norton, Sellers, Pratt & Whitney, Oliver, Hammond G&L, Brown & Sharp.

KELLER MACHINES: BG-1, 5'x10', 3½'x6', 3'x5', Pratt & Whitney.

LATHES: 32"x204" LeBlond, NEW 1954; 52"x52'4" and Size 109". Niles: 18"x15'6" Stillwell-Bierce; 40"x55', 40"x20', 38"x25', 30"x28', 303/4"x50', 303/4"x17', 303/4"x10', 28"x31', 16"x30', 12"x7'6" Bridgeford; Monarch, Lodge & Shipley, American, Reed-Prentiss, Sellers.

DRILLS: Horizontal 4" Dietrich & Harvey, Fairbanks, Newton, Walker-Turner, Foote-Burt, Excelsior.

SAWS: Circular 17"x17", 12"x12" Newton; 18"x18" & 10"x10" Armstrong-Blum; 9"x9" Hacksaw Peerless; Racine, Dewalt, Thor, Clipper.

LOCOMOTIVE CRANES: 35 Ton Steam 50' Boom Orton.

TRAVELING CRANES: 160 Ton, 50 Ton, 25 Ton, 15 Ton—71'10" Span; 15 Ton—48'9" Span; 10 Ton—38'9" Span; 35 Ton Gantry Morgan; Niles, Pratt & Whitney.

POWER PLANT: 1500 H.P. High Press. Boilers; 840 K.W. Diesel Electric Generator Sets; 300 K.W. Steam Engine Generator Sets.

COMPLETE STEEL ANALYSIS and TESTING LABORATORY.

SWITCHING LOCOMOTIVES: 4 Ton & 18 Ton Gasoline F.R.H., with (10) 50 Ton Flat Cars.

BIG TONNAGE: INGOTS, BILLETS, SCRAP METALS, STEEL CABLE, COPPER CABLE, RAIL.

MISCELLANEOUS: Blowers, Fans, Heaters, Railroad Beam Dies, Coal Pulverizers, Air Compressors, Pipe & Bolt Threaders, Storage Tanks, Recording Instruments, Electric Magnet, Lincoln Welders, Metal Spray Unit, Acetylene Generators, Car Puller, Metal Lockers, Office Furniture, Hoists, Motors, Tensile Test Machines, Tools, Dies, Fixtures.

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Swindell Electric Furnace, 5′ dia. shell, 350 KVA, 6600 volts.

Swindell Electric Furnace, 4′ dia. shell, 250 KVA, 6600 volts.

Swindell Electric Furnace, 5′ dia. shell, 500 KVA, 6600 volts.

Allis Chalmers Induction Melting Furnace, 2-600# pots.

Ajax Northrup High Frequency Induction Furnace, spark gap type, 35 KVA with 60# and 17# melting pots.

1—Detroit Electric, 1500# capacity, 13,200 primary voltage. Kuhlman transformer. Complete with controls.

Detroit Electric 350#, Type LFA with Kuhlman transformers and oil circuit breaker, 13,200 primary voltage.

Pennsylvania 1500 KVA transformer, 12,000 V. Never used since rebuilt. With complete controls, mostly new, needed for operation of a furnace. New control panel, Field Rheostat, 25 HP, 440 V MG set.

1—1500 KVA G. E. Transformer with taps for 11,000 or 13,800 volts.

Transformers—2—2500 KVA furnace transformers, 11,000 or 13,800 primary voltage.

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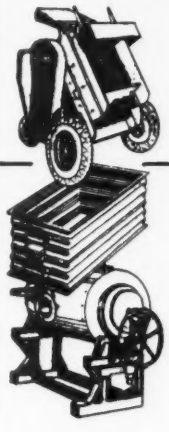

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STEEL APRON CONVEYORS:
Midwest—36″ x 120′
Palmer-Bee—30″ x 19′, 30″ x 5′6″

MOLD CONVEYORS:
1—Webb heavy duty 356′ 109 cars 32″ x 39″
1—Link-Belt 27′ x 70′6″, 35 cars 38″ x 72″

BELT CONVEYORS:
Flat Belt—20″, 24″, 30″, 36″
Troughing—3—24″ x 22′, 1—24″ x 350′

BUCKET CONVEYORS:
2—40′, 3—50′, 8″ x 16″ buckets

AIR COMPRESSOR:
1-I-R two stage 800 CFM 150 HP 3/60/220

OVERHEAD CRANES:
1—3 ton Bedford—40′ span, 120′ runway
1—3 ton Shepard—Monorail 25 HP, 550 DC
1—Chisholm Moore Cupola Charing with 200′ rail 550v 3/60

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60″ x 72″ Ransohoff tumbling type wet cleaning mill, Serial No. 6318, drive 15 HP 3/60/220 and bucket loader 5 HP 3/60/220

MAGNESIUM CLEANING CABINETS

7—Whirlpool Duplex, 800 CFM, 100″ wide x 65″ deep x 90″ high. Buffalo exhausters—7½ HP., 220/440

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1—85 HP G.E. Cupola Blower, 24 oz.
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15—CENTRIFUGAL BLOWERS, 350 CFM to 10,500 CFM.

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1—AMERICAN #1 MULTITABLE, 6 aux. tables 15", main table 45".
SHAKEOUT 4' x 6'.
1—AMERICAN #2 MULTITABLE, 5 tables, 37" dia.
5—US GRINDERS, double end, 10, 15, 20 HP.
4—GRINDERS, Swing frame, 15 HP.
2—TUMBLING BARRELS, Cast Iron, 36" x 24" w/2 HP Motor.
2—TUMBLING BARRELS, Square, 34" x 48".
2—TUMBLING BARRELS, Side Tilt, 18" wide x 20" deep.

CONVEYORS
1—LINK BELT Double Deck Oscillating, 80' long x 24" wide, 1954.
1—45' x 24" wide APRON CONVEYOR
4—SAND ELEVATORS, various sizes.
1—STEEL PLATE MOLD, 90' centers, 30" belt w/drive.
2—STEEL PLATE MOLD, 90' centers, 24" belt w/drive.
6—SAND BELT CONVEYORS, 10' centers to 140' centers, 18" to 36" belt, complete w/drives and hoppers.
2—CASTING CONVEYORS, wire mesh, 18" x 32" w/drive.

CUPOLAS
2—WHITING #6, Complete with Skip Charger.
1—WHITING #5, w/skip, Spencer Blower, Foxboro controls, 2 yrs. old.
1—MORRIS #9, w/skip, mixing ladle, never used.
1—MODERN, #3, 46' shell, w/blower.
2—MODERN #7; Blowers & Controls.
1—SKIP CHARGER, 3 bottom drop buckets, scale for #9 cupola.

CORE BLOWERS
1—3K DEMMLER.
1—SB 13 INTL.
6—#2 DEMMLER.
1—CB-400 CHAMPION.
1—#55 DEMMLER.

FLASKS
150—HINES & FREEMAN ALUM. Pop-offs and jackets, send for list.
TRANSITE CORE PLATES, send requirements.

FURNACES—DIRECT ARC MELTING
1—250#/hr. Hydraulic Top Charge.
1—3000#/hr. LECTROMELT.
1—1000#/hr. HEROULT.
1—2000#/hr. HEROULT.
2—3000# HEROULTS.
1—3 Ton HEROULT.
1—6 Ton HEROULT.

FURNACES—INDIRECT ARC
1—60# DETROIT, complete.
1—350# cap. DETROIT, complete.
1—1000# cap. DETROIT, complete.
1—2000# DETROIT, complete.

FURNACES—INDUCTION MELTING
1—500 KW AJAX, complete.
1—300 KW AJAX, complete.
1—175 KW AJAX, complete.
3—333 KW, AJAX-TAMA-WYATT, 1500# Alum.
2—60 KW AJAX, 60 Cycle, 400#, Alum.
1—7½ KW TOCCO.
1—20 KW AJAX Spark Gap High Freq.
1—3 KW AJAX, Lab. type.
1—30 KW LEPEL.
1—50 KW, G.E., MG Set, 960 cycle.

FURNACES—OIL AND GAS
1—FISHER 4 Burner MNP, 1700#, gas.
4—FISHER, Stationary Holding, 500#, gas.
3—WALKER YORK #400 cruc. tilting, coke fired.
1—SKLENAR 600#, Oil fired.
1—HAUSFELD Tilting, 1200# Mag.
1—R & S Convection Draw, Car bottom, 18' 1 x 8' w x 5' h, oil fired, dismantled, controls.

MOLDING MACHINES
Jolt Rollovers
2—J & J #1020, 50" x 60", 20" draw, 1953.
1—J & J #918, 44 x 54", 18" draw.
1—OSBORN #405, 64 x 50", 18" draw, 3000#.
1—J & J #612, 24" x 30", 12" draw.
2—J & J #815, 30" x 40", 15" draw, 1200# jolt.
1—HERMAN, 8' x 12' Table.
2—HERMAN, 1500#, above ground.
2—HERMAN, 20" x 24", 750#.
1—HERMAN, 50" x 72", 6000# jolt.
1—HERMAN, 42" x 78", 6000# jolt.
1—OSBORN, #243, 27" x 40", 20" draw.
4—TABOR, 22" x 42", pattern draw, port.

Bumpers
1—OSBORN #102.
1—HERMAN, 60" x 72".

Jolt Strippers
4—MILWAUKEE #1536, 32" x 38".
4—SPO, 24" x 24".

Jolt Squeeze Strippers
1—OSBORN #175, 21" x 18", portable.
2—MILWAUKEE #163.
1—MILWAUKEE #165, 16" Pin Strip.
1—MILWAUKEE #124-6, 12" Pin Strip.

Jolt Squeezers
2—INTERNATIONAL, 17" x 20", port.
1—OSBORN #212 PJ, 17" x 23", stationary.
4—OSBORN #276-J.
3—OSBORN #275-J.
3—TABOR, 18" x 20", 3" jolt, column.
1—TABOR, 18" x 20", 3" jolt, cantilever.
1—ADAMS, 19" x 20" portable.
2—SPO #213-GP.
1—SPO #110-J.

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2—WHITING 3 Ton. Bottom pour.
4—10 TON BOTTOM POUR. 55" x 55".
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4—800# Worm Geared, Lip Pour.
3—1500# TEAPOT, Lip Pour, Worm Geared.
3—5 Ton to 9 Ton, Worm Geared, Lip Pour.
1—SWINDELL, Elec. Holding.

MULLERS AND MIXERS
1—SIMPSON #0.
1—SIMPSON #3, enclosed gears.
2—SIMPSON #2, Unit Drive.
2—CLEARFIELD #610 and #920.
1—B & P SPEEDMULLER, #70.
1—BEARDSLEY & PIPER #60 SPEEDMULLER, 60 HP motor, SKIPLOADER.
1—B & P MULBARO, #7, extra Base.

OVENS
1—FOUNDRY EQUIP. CO., 2 comp., rack, 12'-10" x 15'-8" x 7'-10"; oil, external recirculating.
1—TOWER CORE OVEN, 14" x 60" trays, 45' high, gas fired, dismantled.
2—ROSS 2 comp., rack, gas, 6½ x 14 x 7.
1—PORBECK, 4 drawer, double end, oil.
1—YOUNG BROS. 3 compartment, kiln type electrically heated, with CONTROLS.
1—YOUNG BROS. 2 compartment, drawer type, oil or gas, 82" h x 12' w x 6' l.
1—YOUNG BROS. 3 door, gas, 12' x 8' x 6'-3", recirculating, blower and recorder.
1—COLEMAN, Oil, 2 Comp., Rack Type, Recirc; each comp. 60" wide x 80" high x 14'-6" deep.
1—COLEMAN, Double Door, Oil, Single Comp., Recirc., 60" wide x 14'6" deep x 80" high.

SAND CUTTERS
4—AMERICAN SAND CUTTERS.
1—MODEL "K", 72" reel, Gas Driven.
1—MODEL "F", 80" reel, Gas Driven.
1—MODEL "D", 76" x 96".
1—SANDMASTER, 70/102, New in 1950. Rubber Tires.

SAND LABORATORY EQUIPMENT
1—Complete SAND LABORATORY
1—TEST CORE BAKING OVEN #606.

SAND PREPARATORS
2—JEFFREY SANDITIONERS, Portable.
2—ROYER SAND BLENDERS, 16" belt.
5—ROYER SAND BLENDERS, 12" belt.
1—LINK BELT REVIVIFIER, Size 5.
1—HETHERINGTON & BERNER SAND DRYER, rotary, oil fired #552.

SAND SLINGERS
1—BEARDSLEY & PIPER MOTIVE JR. 19" head.
1—BEARDSLEY & PIPER TRACTOR TYPE 16" head magnetic separator.
1—PORTABLE SLINGER 16" head, 4' long, on Truck.

TESTING MACHINES
1—TINIUS OLSEN, UNIVERSAL, 100,000# capacity.
1—TINIUS OLSEN, BRINELL HARDNESS, 3,000 KG.
1—RIEHLE, UNIVERSAL, 2 screw mechanical, 100,000# capacity.
1—BALDWIN, UNIVERSAL. Hydraulic tensile, 60,000#.

TRUCKS
1—HOUGH PAYLOADER, Model HA, Hydraulic Trip.
2—BELL PRIME MOVERS, 1000# capacity, gas driven.
1—LEWIS SHEPPARD, 4000#, elec. Fork Lift.

MISCELLANEOUS
1—GARDNER VERTICAL DISC GRINDER.
6—PENN DUMP BUCKETS, 1000# to 4 ton.
4—CURTISS AIR HOISTS, barrel type.
1—HOFFCO Vacuum Cleaner, #75.
1—ALLEN-BILLMEYER Vacuum Cleaner, port.

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Ingersoll Rand Type 10, 800 CFM, 2 stage air compressor, 200 HP, 220 V motor. Rebuilt 1952.

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BLOWERS

Ingersoll-Rand Motor Blower Type FS. Single Stage 4000 CFM @ 3.75 PSI, 100 HP, 220V G. E. Induction motor.

General Electric 7500 CFM, 20 oz., 89.6 Max. HP, 220V motor, Airway controls.

Ingersoll-Rand turbo compressor 10500 CFM @ 20 oz. 85 HP G. E. 220V 3500 CFM motor.

CLEANING EQUIPMENT

Sly 8′ dia. Table Shot Blast Unit.

CORE BLOWERS

3—International SB 12.
4—International SB 13.
10—Osborn 193.
1—Osborn 2035-2.
1—Champion CB 400.
2—CB 10 Late Type.

CORE GRINDERS

6—Milwaukee 70-9.

CORE OVEN VERTICAL HORIZONTAL

1—Coleman, combination oil or gas fired 43 carriers 24″ x 90″—1 hour 12 min. to 4 hours 48 min. cycle.

1—Coleman, combination oil or gas fired 43—2 shelf carriers 30″ x 144″ long. 2 hour 12 min. to 7 hour 24 min. cycle. Present replacement cost over $90,000.

CORE PASTE OVENS

2—Coleman Gas Fired 28′-25″ x 42″ opening Complete.

CRANES

1—Milwaukee 10 ton 40′ span, 22′ lift, 220 V. A.C.
2—Northern 5 ton 40′ span, 22′ lift, 220 V. A.C.
1—Whiting 5 ton 40′ span, 22′ lift, 220 V. A.C.

GRINDERS

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Gardner #186, 30″ dia. disc. 10 HP, 220/440V, with dresser, wet or dry grinder.

Gardner HV5A, 18″ dia., 7½ HP, 440V, with dresser.

Double End Disc:

2—U.S. 18″ wheels, 2 swing tables, 1 with lever feed.

GRINDERS, SNAGGING

2—Hammond 10 WRI Double End Snag. Grinders 20″ dia. wheels, 10 HP 220/440 v motors, variable speed drives.

1—3″ x 24″ U.S. #65, 20 HP 220/440V.

GRINDERS, SWING FRAME

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1—3″ x 24″ x 12″ Marschke, 20 HP.
1—3″ x 24″ x 12″ U.S. 15 HP.

HOT METAL CARRIERS

3—1 ton D.C. Cab operated Cleveland, Monotractor Hot Metal Carriers.

MOLDING MACHINES

Jolt Squeezers:

5—Milwaukee 103-11 Staty. Jolt Squeezers, 13½″ x 20″ table.
7—Champion JS10P Portable Jolt Squeeze molding machine. 18″ x 21″ table.
10—Osborn 275J.

Jolt Squeeze Pin Lifts BIG

2—International PK 20's. 20″ squeeze cylinder 8″ draw. Ser. #67237. New 1949.
2—Milwaukee Jolt Squeeze Strippers, Model 163-50, 15″ x 24″ table 16″ X open end pattern size.
1—Milwaukee 126-3 Jolt Squeeze Pin Stripper, 27″ x 21″ table, 8″ draw. Portable.
2—#165 Milwaukees.

ROLLOVERS

Jolt Rollover Pattern Draw

1—Herman 4000# Series 30″ x 60″ table, 32″ x 48″ bumper.
1—Herman 3000# Series 40″ x 84″ table, special slotted table.
1—Herman 1500# Series 20″ x 36″ table.
2—Herman 750# Series 20″ x 30″ table.
2—Herman 750# Series 20″ x 24″ table.
1—Davenport 24 SA Jolt Rollover Pattern Draw. 26″ x 42″ flask size, 12″ draw.
3—Spo Model 9032.
1—Milwaukee 217.
2—International Type G, Portable, 20″ x 8″ draw.
3—Tabor Portable Rollover 30″
Johnson & Jennings 1020-44 x 44 max. Flask Size.

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6 No. 2 Simpson Mullers

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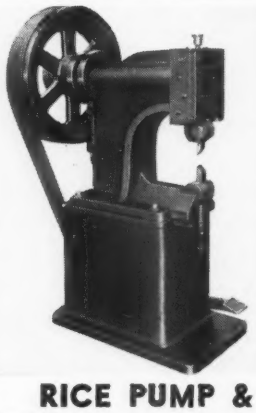

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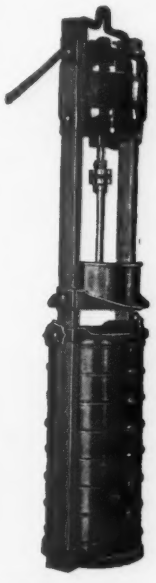

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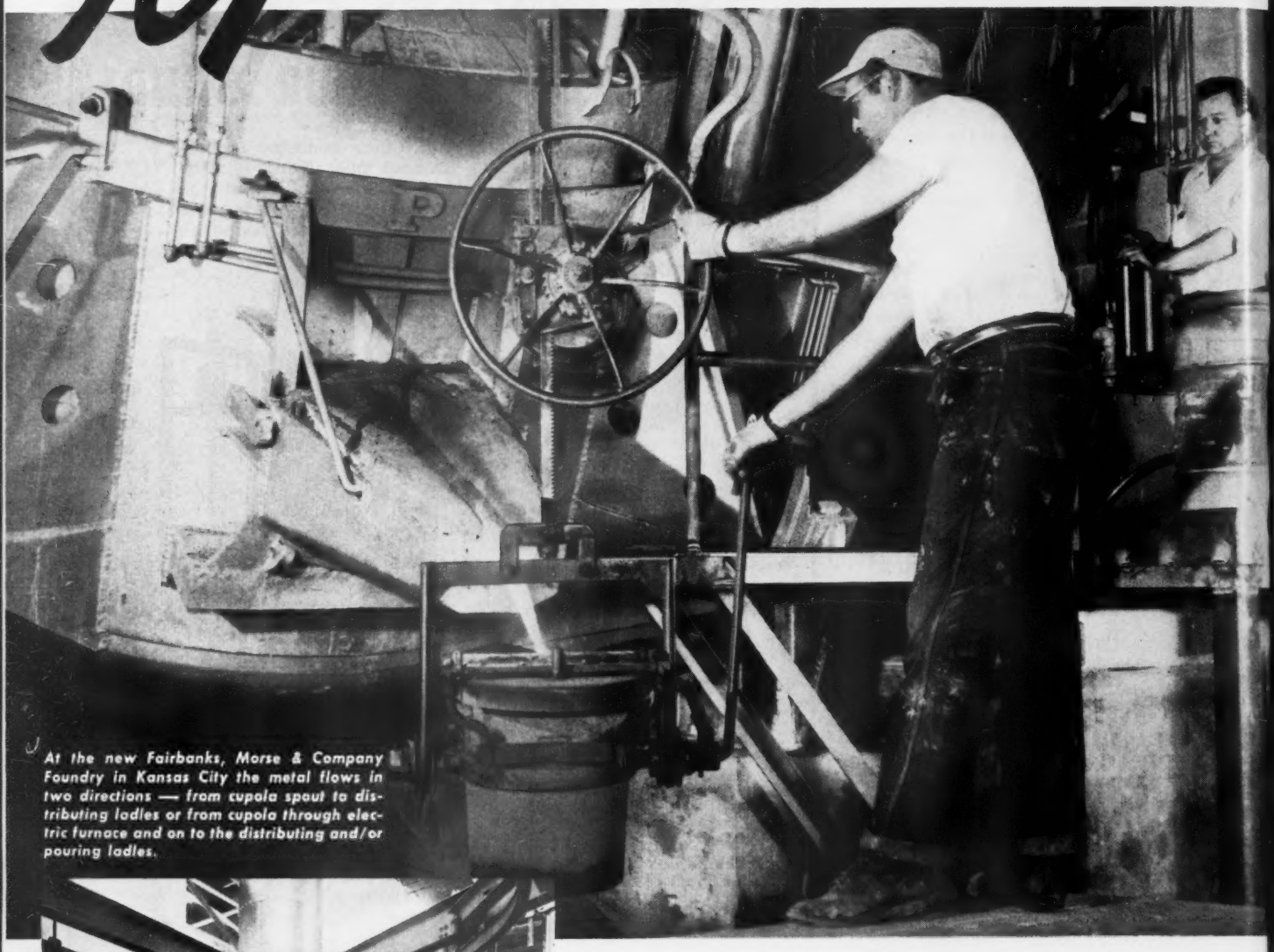
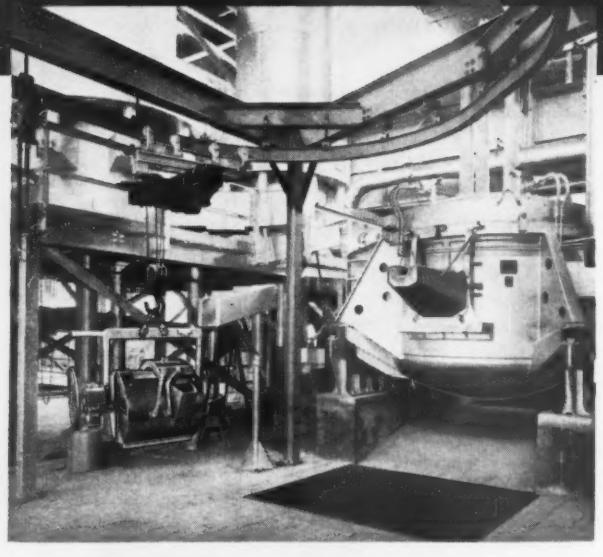


At the new Fairbanks, Morse & Company Foundry in Kansas City the metal flows in two directions — from cupola spout to distributing ladles or from cupola through electric furnace and on to the distributing and/or pouring ladles.



FOR TOP EARNINGS!

POURING AND DISTRIBUTING SYSTEMS are just as productive as the engineering that goes into their over-all planning: Large castings, small castings, high tonnages, low tonnages, ferrous and non-ferrous all make a difference. "Showing-how" to cope with all these varying conditions is the extra value you gain when you plan with MODERN. Catching from the electric furnace, after duplexing, and moving the metal direct over monorail to mold is one of those different applications. Check-marking the catalogs you may require is a fast, easy way to learn more about your charging, melting and pouring problems . . .

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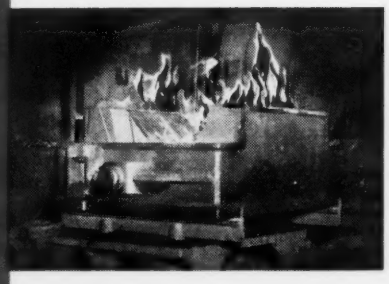
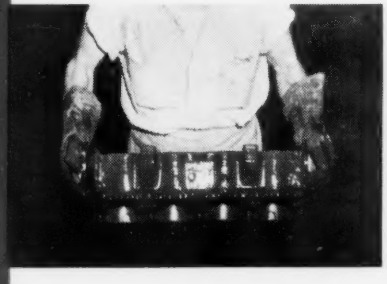


IGNICOAT—FAST DRYING MOLD SPRAY

Eliminates lengthy drying of mold coating by torch or oven. Can be sprayed, brushed or swabbed. Ignicoat mixes rapidly with isopropyl alcohol and contains the proper percentage of binder to insure good film adherence to the sand. When ignited, burns with a gentle flame. Molds may be closed and poured as soon as burning stops.

RED-SKIN CORE COATING

Does not run, streak, tear-drop or pile up at the edge of the core. It is a refractory type core coating that insures clean peel of sand from castings. The new Stevens Red-Skin reduces costs and aids in the production of better castings when used on molds and cores for steel, grey iron and non-ferrous metals. Red-Skin has deep penetration and seals several layers of sand, to prevent metal penetration.



GRAPH-KOTE COATING

Graph-Kote is a "short" coating which means a sharp dip line. It coats only where the coating is needed, assuring accurate fitting of core prints and assemblies. Cores can be dipped faster and its even uniform coating gives ample coverage to produce clean castings. In its original paste form, Graph-Kote can be stored indefinitely in the original Stevens polyethylene lined drums.

NEW IMPROVED FASTICK LIQUID CORE PASTE

Has very rapid air or oven drying qualities. Gives excellent results with resin-bonded cores and shell molds. Permits elimination of clamps on shell mold halves. Strength is not reduced at high temperatures. As a time saver, Fastick will reduce your costs as it is mixed and ready to use when received.

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● Tailor made to your kind and type of work, your production requirements and plant conditions, Bartlett-Snow foundry systems assure faster delivery — of better castings — at lower cost. Ample working areas, free access to machines and proper arrangement of equipment eliminates stock-piling and re-handling between operations, automating the smooth, efficient flow of material from sand and metal storage to the shipping dock. Our wide experience includes substantial installations in many of the country's newest, best known and lowest cost foundries. Let us work with you on your next project.

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